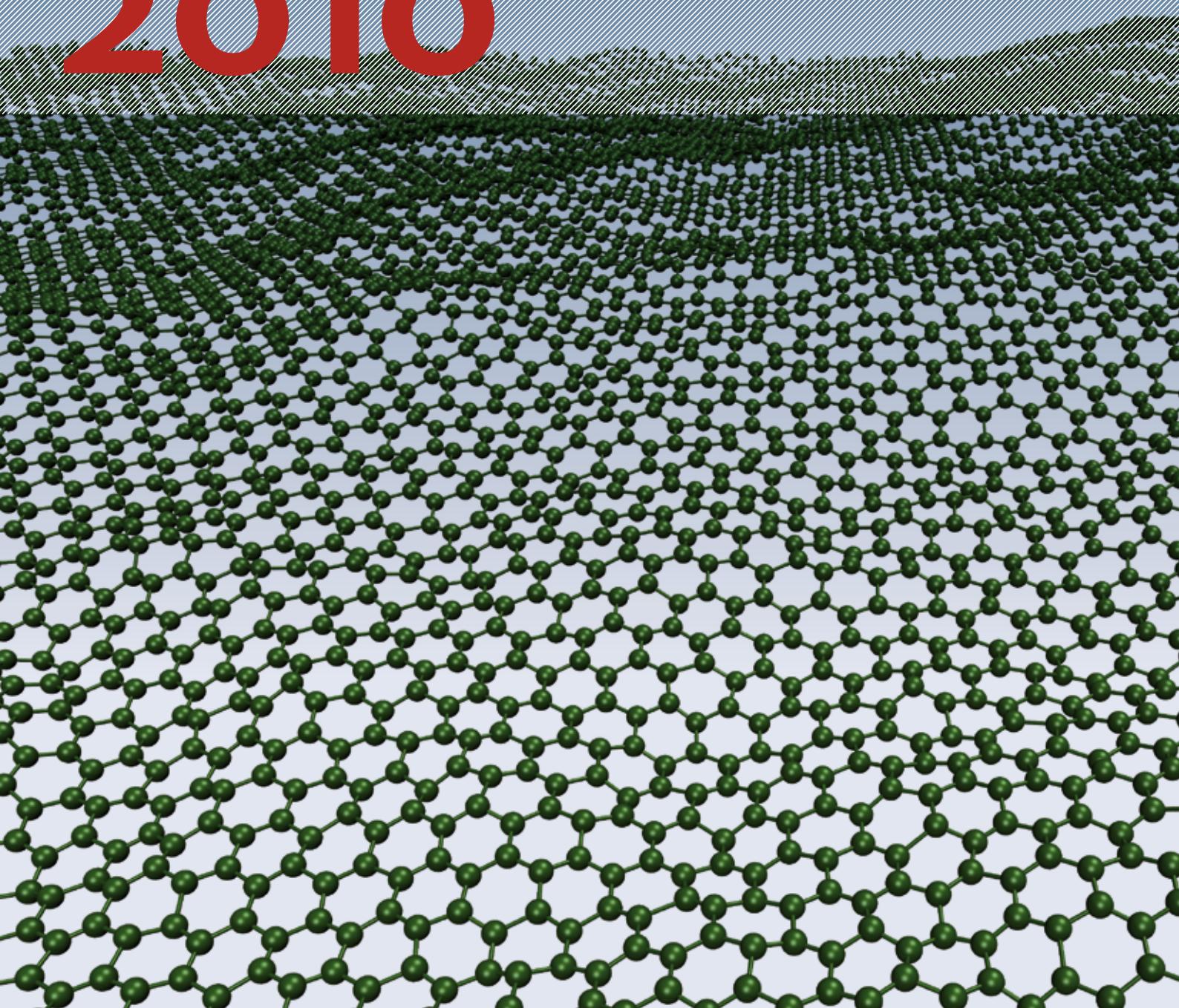


# Research Report 2010



Radboud University Nijmegen



# Radboud University Nijmegen

## 2010 Research Report

Radboud University Nijmegen



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# Preface

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In many respects, 2010 has been a good year for Radboud University Nijmegen. Our researchers again published more papers in total than in the previous year, and the number of publications in leading journals such as *Science*, *Nature*, *The Lancet* and *The New England Journal of Medicine* also rose. Above all, the work of André Geim, an Extraordinary Professor at the University, and Prof. Konstantin Novoselov, who earned his doctoral degree here, gives us reason to be proud. Together they received the Nobel Prize in Physics for “groundbreaking experiments regarding the two-dimensional material graphene”. Our University played a big role in this scientific discovery (a third of the papers have a co-author from Nijmegen). Professor Katsnelson, in particular, contributed substantially to the theoretical foundations of this promising material.

By defining a more distinctive research profile and through closer partnerships with complementary institutions, we are also anticipating societal needs such as those identified in the strategies for the future from the Dutch government and from the European Union.

Research at Radboud University Nijmegen is in good shape across the board. This was proven once again by recent evaluations of our research programmes. Thanks to these achievements, the University has risen in the major international rankings.

Good scientific research helps society to move forwards, as you can read in this edition of our annual Research Report.

Roelof de Wijkerslooth MSc  
*President*

Prof. Sebastian Kortmann  
*Rector Magnificus*



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# Introduction

Economic, cultural and societal development has been the *raison d'être* of science policy for decades. Radboud University Nijmegen contributes to each of these ambitions in various ways. We are prominently involved in a range of economically valuable innovations, and we also take responsibility for enriching cultural and societal development. This has been achieved by specializing in four of the five scientific domains: Arts & Humanities, Social Sciences, Natural Sciences and Life Sciences. For the fifth domain (Technical Sciences) – which is not one of our core competencies – we cooperate closely with partners.

Under pressure from the financial crisis, the government of the Netherlands has chosen to emphasize the importance of science in stimulating economic growth. In its recent policy document entitled 'To the top', a plan was presented for public investments in science in a number of economically important sectors. The 'Top' sectors in this plan will provide the framework for discussions and joint initiatives involving government, companies and research institutions. Also in the EU's '2020 Strategy' – which was launched in 2010 – the applicability of scientific research to innovation is further accentuated.

As you can read in this Research Report we operate successfully at the centre of society. Moreover, as a research university we play a significant role in achieving both the EU's and the Dutch Government's strategic plans.

For instance we:

## EU2020 Strategy

- A. Energy security
- B. Transport
- C. Climate change
- D. Resource efficiency
- E. Health & ageing
- F. Environmentally friendly production methods
- G. Land management
- H. Building the bio-economy
- I. Key enabling technologies for industrial future
- J. Technologies to support older people

## EU2020 / Top-sector

• hold the world record for most energy-efficient (24,5%) photo voltaic cells	A, I / 4
• manipulate or synthesize novel nanomaterials with properties most useful in industry such as graphene, or in chemical processes like catalysis	D, E, F, I / 3, 8
• designed an innovative energy generating waste-water treatment system	A, D, F, G / 4, 9
• build and improve human-computer-interfaces for various purposes such as hearing and speaking disorders	E / 3, 7
• constructed many new effective diagnostic methods for several serious diseases like cancer and Alzheimer	E / 7
• created powerful tools to enable plant breeders and propagators to produce effectively new varieties of crops	D, F / 1, 2
• initiated large national and international programmes on sustainable river management	C, D, F, G / 9
• contributed to highly successful art and historic expositions e.g. <i>Rembrandt-Carravaggio</i> and <i>Herculaneum</i>	6
• developed an advanced simulation model for intra-urban parking, and for future transport scenarios	B / 5
• generated about 4000 jobs at spin-off companies in the region, mostly in the Chemistry, Life Sciences, ICT and Communication & Consultancy sector	A, B, D, E, F, G, H, I, J / 3, 4, 5, 6, 7, 8, 9

## Top-sectors Netherlands

- 1. Agro-food
- 2. Horticulture & plantbreeding
- 3. Hightech materials and systems
- 4. Energy
- 5. Logistics
- 6. Creative industry
- 7. Life sciences
- 8. Chemistry
- 9. Water

## Our societal impact

By carrying out high-quality research in the the four scientific domains mentioned above, we are able to acquire prestigious research grants and research contracts with private and public stakeholders: about one third of our annual turnover is based on contracts with public or private institutions. The relevance of our university-wide strength and importance is being reflected in seven societal themes:

1. Culture, Religion and Identity
2. Language and Communication
3. Societal Development and Justice
4. Behaviour and Education
5. Molecules and Materials
6. Water and Wetlands
7. Genetics, Health and Ageing

## Our ambition

In 2004, Radboud University Nijmegen was the first Dutch university to group all its research within dedicated research institutes. These institutes have proven their value and are the motor behind the present strength of research at the University. They are responsible for planning research as well as for training and supervising PhD students. In this way, the University has optimized its significant role in encouraging innovation by delivering new generations of well-trained researchers and through active dissemination of scientific results. Researchers at the University frequently contribute to debates, publish news items in the media and join advisory councils.

All research institutes and their programmes have evolved and improved in recent years. The quality of research has been further enhanced by close cooperation with partners who complement our expertise. In the Netherlands these partners are: the Max Planck Institute for Psycholinguistics (MPI), the Foundation for Fundamental Research on Matter (FOM), the University of Groningen, the University of Twente, Wageningen University & Research Centre and Eindhoven University of Technology. Next to these institutions, we join forces with a large number of scientific relations worldwide (see inside front cover).

It is our ultimate aim to become one of Europe's top academic institutions. In 2010, we once again made good progress towards achieving this ambition. Numbers of academic publications, publications in top-ranking journals, dissertations and research grants – mostly obtained in strong competition with other universities – have increased substantially (see Figures 1-4).

## Key figures Radboud University Nijmegen

### Research staff

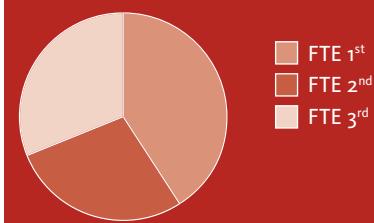
#### Tenured

Full Professors	160.9 FTE
Associate Professors	77.4 FTE
Assistant Professors	167.4 FTE
Researchers	111.2 FTE
Lecturers	4.1 FTE

#### Non-tenured

Researchers	532.8 FTE
Lecturers	8.3 FTE
Doctoral candidates	922.3 FTE

### Research input



### Research output

Dissertations	283
Scientific publications	5659
Professional publications	907
Annotations	182
Patents	19

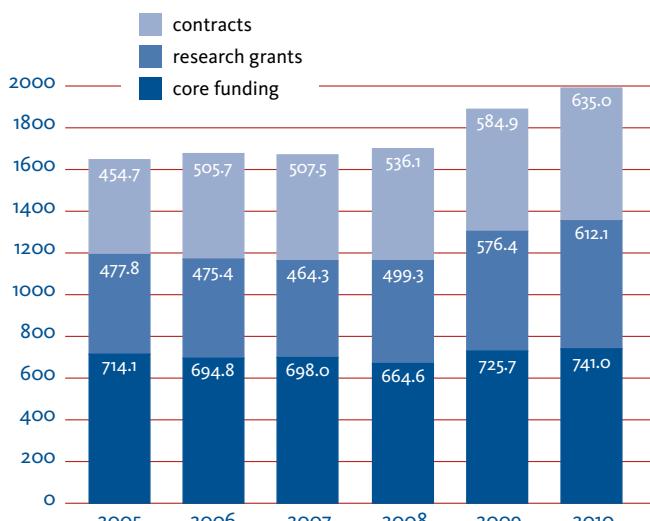


Figure 1: Researchers (in FTEs) per year

# Our scientific reputation in 2010



On 24 November 2010 Prof. André Geim and Prof. Konstantin Novoselov received the Royal distinction 'Commander in the Order of the Lion of the Netherlands' from Halbe Zijlstra MSc, the State Secretary of Education, Culture and Sciences.

The announcement that Prof. André Geim and Prof. Konstantin Novoselov had won the 2010 Nobel Prize for Physics was a major milestone in the history of Radboud University Nijmegen. Prof. Geim was an Associate Professor at the University from 1994-2001 and is currently an Extraordinary Professor in Innovative Physics and Nanoscience. Prof. Novoselov graduated here in 2004 with a PhD on his research at the High-Field Magnet Laboratory (HFML). Both scientists currently hold a chair in Physics at the University of Manchester in the UK.

Since their discovery of graphene, they have worked closely together with Prof. Mikhail Katsnelson – a theoretical physicist at our University – on the characteristics of this extremely promising material. Graphene, which consists of a monolayer of carbon atoms, is the strongest material known to mankind. Exceptional properties such as its excellent conductivity open up the potential for new applications in computing and nanotechnology.

Between 2004 and 2010 Profs Geim and Novoselov published 26 joint papers with researchers from the Institute for Molecules and Materials (IMM) at our University. The strong links between the Physics teams in Manchester and Nijmegen is demonstrated by the following key publications in 2010:

- Ponomarenko, L.A., Yang, R., Gorbachev, R.V., Blake, P., Mayorov, A.S., Novoselov, K.S., Katsnelson, M.I. & Geim, A.K. (2010). Density of States and Zero Landau Level Probed through Capacitance of Graphene. *Physical Review Letters*, 105(13), 136801.
- Wehling, T.O., Yuan, S., Lichtenstein, A.I., Geim, A.K. & Katsnelson, M.I. (2010). Resonant Scattering by Realistic Impurities in Graphene. *Physical Review Letters*, 105(5), 056802.

## External evaluations

University research institutes such as those at Radboud University Nijmegen are periodically evaluated by an international committee of peers. Based upon their assessment and recommendations, plans for further improvements are implemented.

The Review Committees assess the institutes according to the Standard Evaluation Protocol for scientific research in the Netherlands. For each research programme, there are four criteria: 1) quality, 2) productivity, 3) relevance and 4) vitality & feasibility. The assessments range from excellent to unsatisfactory, and are defined as follows:

- Excellent: leading, at the forefront worldwide
- Very good: internationally competitive, leading nationally
- Good: nationally competitive, visible internationally
- Satisfactory: visible nationally
- Unsatisfactory: not worth pursuing.

In 2010 some departments at our research institutes participated in nation-wide organized research evaluations:

- The Department of Astrophysics at the Institute for Mathematics, Astrophysics and Particle Physics participated in the evaluation of the Netherlands Research School for Astronomy (NOVA).
- All chemistry departments at the Institute for Molecules and Materials participated in the nationwide evaluation of chemistry research.

In the Assessment Report on NOVA, the Department of Astrophysics was found to be among the top ten percent of astronomy institutes in the world. The Department was commended for having the 'most positive gradient' and for being the 'most forward looking' of the Dutch university astronomy departments. NOVA itself was reviewed as 'exemplary' among the six Top research schools within the Netherlands.

The Assessment Report on Chemistry Research will appear in the spring of 2011.

In the spring of 2010 the reports on the national research evaluations in which some of the research institutes participated in 2009 were released. The Institute for Computing and Information Sciences (ICIS) was rated "excellent" and judged to be the best Computing Science institute in the Netherlands. The Department of Mathematics at the Institute for Astrophysics and Particle Physics (IMAPP) was commended for achievements, outreach activities and choices for the future. The Review Committee judged the quality of the research staff as "very good". They expressed their worries about the poor funding possibilities in Dutch mathematics in general and about the relative high teaching load on staff members.

## Radboud University Nijmegen has the following faculties:

Faculty of Philosophy, Theology and Religious Studies  
Faculty of Arts  
Faculty of Law  
Faculty of Social Sciences  
Nijmegen School of Management  
Faculty of Science  
Medical Centre (Faculty of Medicine and University Hospital)

## Fundamental and applied research is carried out within specialized institutes:

Research Institute for Philosophy, Theology and Religious Studies  
Institute for Historical, Literary and Cultural Studies

Research Centres of the Faculty of Law  
Institute for Management Research

Nijmegen Institute for Social & Cultural Research

Centre for Language Studies  
Behavioural Science Institute  
Donders Institute for Brain, Cognition and Behaviour  
• Centre for Cognition  
• Centre for Cognitive Neuroimaging  
• Centre for Neuroscience

Institute for Genetic and Metabolic Diseases  
Research Institute for Oncology  
Nijmegen Institute for Infection, Inflammation and Immunity  
Nijmegen Centre for Evidence-Based Practice  
Nijmegen Centre for Molecular Life Sciences

Institute for Water and Wetland Research  
Institute for Molecules and Materials  
Institute for Mathematics, Astrophysics and Particle Physics  
Institute for Computing and Information Sciences  
Institute for Science, Innovation & Society

## Preparing for a career in research with Research Masters studies:

Behavioural science: the study of behavioural regulation  
Cognitive neuroscience  
Historical sciences  
Art and visual culture  
Language and communication: the empirical study of human communicative capacities  
Literature and literary sciences: new philology  
Molecular mechanisms of disease  
Business and Law  
Philosophy  
Social cultural science: comparative research on societies

# Our scientific reputation in 2010

## ERC Advanced Grant laureates

Prof. Pieter Muyken  
Prof. Mike Jetten  
Prof. Heino Falcke  
Prof. Conny Aerts  
Prof. Wilhelm Huck  
Prof. Stephen Levinson  
Prof. Guillén Fernández



The Research Centres of the Faculty of Law were on average evaluated as “very good to excellent”. Highest scores were awarded to the Business & Law Research Centre and the Centre for Migration Law.

The *Institute for Molecules and Materials* (IMM) was re-accredited by the Royal Netherlands Academy of Arts and Sciences.

The *Behavioural Science Institute* (BSI) and the national *Research School Subatomic Physics* (which is coordinated by the IMAPP) received a grant from the Netherlands Organisation for Scientific Research (NWO) for further improving their excellent education and research environment for highly gifted young researchers.

## Talent policy

The Radboud Honours Academy offers the ten percent most talented and motivated Bachelor's students of Radboud University Nijmegen the opportunity to follow a special supplementary programme during the second and third year of their Bachelor's programme.

Radboud Honours Academy is made up of nine disciplinary honours programmes for students who wish to deepen the knowledge of their own field of study and one interdisciplinary honours programme for students who wish to broaden their knowledge of other disciplines. The programmes are offered in addition to the students' regular course of study and the workload is approximately 850 hours.

For Radboud University Nijmegen it is of the utmost importance that excellent students work and study in a high-quality international academic or professional setting. For that reason all of the programmes at the Radboud Honours Academy offer students a work placement at a renowned foreign university, research institute, company or office. These associated partners of the Academy are not merely engaged in regular training. They are involved in the composition of each programme and the individual coaching of students.



Figure 2: Scientific publications per year

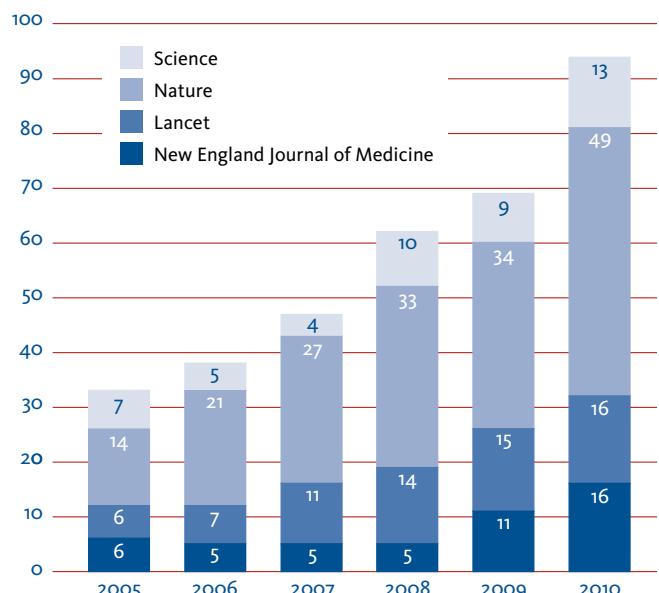


Figure 3: Publications per year

#### Spinoza Award laureates

2008 Prof. Theo Rasing  
2006 Prof. Carl Figdor  
2005 Prof. Peter Hagoort  
2002 Prof. Henk Barendregt  
2001 Prof. Bert Meijer  
1999 Prof. Anne Cutler  
1998 Prof. Pieter Muysken



During their honours programme students are personally supervised by a senior researcher, who works closely together with them in order to achieve the targets in the student's personal training agreement.

At the Master's stage talented students who plan a career in research have the opportunity to follow a two-year Research Master's Programme. Radboud University Nijmegen offers ten Research Master's Programmes (see box on the right).

#### Grants for excellent young scientists

Young scientists and Research Master's students at the University continue to deliver outstanding results. In 2010, more than fifty excellent young researchers won prestigious national or international grants, competing with some of the best in the world.

Eight talented young researchers received an NWO Veni grant in 2010, which will enable them to do research for three years after graduating with a PhD. The winners are Drs Bas Dutilh, Ali Mazaheri, Joris Mooij, Luc Selen, Mangale Srinivas, Rutger Vogel, Vivian Weerdesteyn and Guido van Wingen.

Ten post-doctoral researchers received NWO Vidi grants, which will enable them to develop their line of research for five years. These grants were awarded to Drs Brigitte Adriaensen, Aoju Chen, Judith Homberg, Esther Janse, Joost Martens, Bas van de Meerakker, Sebastiaan Overeem, Herma Cuppen, Lotte Jensen and Hilde Bras.

Five prestigious Starting Grants from the European Research Council were awarded to Drs Herma Cuppen, Hans Elemans, Alexey Kimel, Marguerite Corporaal and Christian Doeller.

Five talented medical students (Margreet Kouwenberg, Christiaan Mooij, Derya Yakar, Max Bruins and Ruben Cremers) won a ZonMw AGIKO grant, which will allow them to be trained both as medical specialists and as clinical researchers.

Fifteen young researchers received an NWO Rubicon Scholarship to enable them to go abroad to conduct research immediately after gaining their doctorates. These scholarships were awarded to Drs Hanneke van Dijk, Dorien Kool, Shaozheng Qin, Sita Vermeulen,

Bart Ferwerda, Edita Poljac, N. Smits, Wouter Swierstra, Sara Bögels, Ron Dotsch, O. Fatunsin, M. Ferraye, G. Sescosse, Julie Krans and Oliver Langner.

One Research Master's student (Verena Ly) was awarded an NWO Mozaiek Grant for a four-year PhD research programme which she designed herself. The NWO Mozaiek Grant, which is given to talented students from ethnic minorities, is designed to support their academic careers.

Finally, the following young researchers also won major prizes in 2010:

- Dr Bé Breij received the Keetje Hodshon Prize for her dissertation on *The Eighteenth and Nineteenth Major Declamations Ascribed to Quintilian: A commentary* (published in 2007) and for her other academic strengths. This prize is awarded by the Royal Holland Society of Sciences and Humanities to encourage young researchers.
- Dr Sigrid Pillen received the Young Investigator's Prize from the Dutch Society for Paediatrics.
- Thomas Hambrock MSc received the Lauterbur Award, a prestigious prize from the Society of Body Computed Tomography and Magnetic Resonance.
- Johan Gielis, PhD won the Social Innovation Award (Tilburg) and shared the Young Antenna Engineer 2010 award of the European Space Agency (ESA).

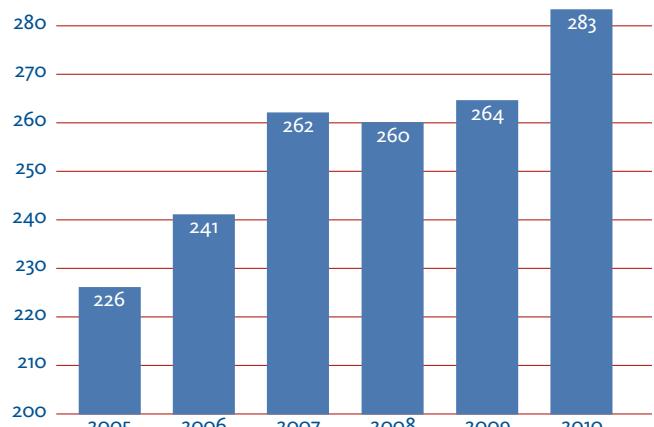


Figure 4: Dissertations per year

# Research Institute for Philosophy, Theology and Religious Studies

The central research topic of the philosophical research is the concept of *rationality*. Rationality is often seen as a distinctive characteristic of human beings. But what does it mean to be a rational being, and how can 'rationality' be defined? From what standpoint can we judge the rationality of the beliefs, actions and practices of ourselves and of others? Do our categories of reasoning and our standards of truth and consistency enhance or distort our understanding and interpretation of others? What are the foundations of rationality and how has this concept developed over time? The research in the fields of theology and religious studies focuses on the interaction of religions in their various social, cultural and political contexts. Its aim is to develop, integrate, facilitate, perform and valorize excellent research in theology and religious studies, and to educate and supervise new generations of scholars.



The systematic study of rationality is carried out in the context of the following research programmes:

- *Cognition, Interpretation and Context* (Prof. M. Slors)
- *The Project of a Hermeneutic Philosophy* (Prof. P. van Haute)
- *From Natural Philosophy to Science* (Prof. C. Lüthy)
- *Ethos, Polis and Religion* (Prof. E. van der Zweerde)

These four programmes deal with different aspects of a range of things that are considered 'rational'. The first programme relates to conceptions of belief, cognition and language. It addresses the various ways in which we interpret and understand human behaviour – linguistic and otherwise – in its physical and social context. In the second, the relationship between rationality, meaning and interpretation is examined. The third programme focuses on the emergence of science as the key paradigm of rational thinking in Western Europe and traces the history of long-term developments and transformations in scientific thinking from its philosophical beginnings. The fourth programme focuses on the concept of *practical rationality* and its impact on ethics, politics, and religion, addressing the idea of the 'city' as both a political and

ethical community. A variety of methodological approaches are used in the research programmes: analytical, hermeneutical, critical, and historical. This makes the Institute one of the few places where a dialogue between these very different approaches can take place.

The research programme 'Religions and Transformation in Contexts' (RATIC; 2007-2012) makes a scientifically and socially relevant contribution to our insight into religious dynamics by focusing on the concept of *transformation*. While this concept is commonly associated with dynamics, it is seldom accurately defined or operationalized. In the RATIC programme, transformation is studied as a process of change in religious and spiritual identities, both at the level of the individual believer and at the collective level of communities and institutions. The RATIC programme is carried out by five research groups:

- *Trajectories of Religiosity* (Prof. E. Venbrux)
- *Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism* (Prof. E. van Wolde)
- *Transformations of the Concepts, Practices and Representation of Discipline in Christianity* (Prof. D. Müller)



## Staff

Prof. P.J.J.M. Bakker (p)  
 Prof. W.P. van den Bercken (e)  
 Prof. J.A.M. Bransen (o)  
 Prof. H.G.G.M. Driessens (o)  
 Prof. G. Essen (o)  
 Prof. R.L. Grimes (p)  
 Prof. M.A.C. de Haardt (p)  
 Prof. P.I.M.M. van Haute (o)  
 Prof. C.A.M. Hermans (o)  
 Prof. A.J.M. van den Hoogen (p)  
 Prof. C.H. Lüthy (p)  
 Prof. F.A. Maas (o)  
 Prof. H. Motzki (p)  
 Prof. D.A.T. Müller (o)  
 Prof. P.J.A. Nissen (p)  
 Prof. J. van Oort (p)  
 Prof. R.A. van der Sandt (o)  
 Prof. J.B.A.M. Schilderman (p)  
 Prof. M.V.P. Slors (o)  
 Prof. H.G.B. Teule (p)  
 Prof. J.M.M.H. Thijssen (o)  
 Prof. P.J.M. van Tongeren (o)  
 Prof. B.H. Vedder (o)  
 Prof. P.J.C.L. van der Velde (p)  
 Prof. J.A. van der Ven (p)  
 Prof. H.J.M. Venbrux (o)  
 Prof. C.H.M. Versteegh (o)

Prof. J.G. van der Watt (o)  
 Prof. F.J.S. Wijsen (o)  
 Prof. J.-P. Wils (o)  
 Prof. E.J. van Wolde (o)  
 Prof. E. van der Zweerde (p)

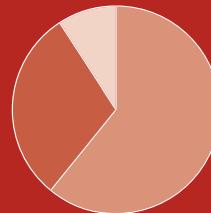
(o), (e) and (p) see Glossary

### Tenured

Full Professors	10.7 FTE
Associate Professors	1.6 FTE
Assistant Professors	7.2 FTE
Researchers	3.6 FTE

### Non-tenured

Researchers	6.8 FTE
Doctoral candidates	19.4 FTE



■ FTE 1<sup>st</sup>  
 ■ FTE 2<sup>nd</sup>  
 ■ FTE 3<sup>rd</sup>

- *Transformation of Religion within the Frameworks of Modernity* (Prof. G. Essen)
- *Religious Identity Transformation in Context* (Prof. C. Hermans)

### Trajectories of Religiosity

Researchers in this group, which combines comparative religious studies with the anthropology of religion, focus on 1) ritual and religiosity (death rites, pilgrimage, and religious tourism), 2) religion and the arts, 3) religion, conflict, and media, 4) methods and theories of comparative religious studies, and 5) the history of religions.

**Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism**  
 This group focuses on biblical and extra-biblical texts that mirror religious transformations in social, political or religious contexts. Research concentrates on interpreting a number of key texts on religious transformations, different levels of interpretation, and re-interpreting early Christian and Jewish texts, as well as their historical, religious and hermeneutical backgrounds.

### Transformations of the Concepts, Practices and Representation of Discipline in Christianity

This group focuses on the transformations of concepts and practices of 'discipline' (regarding both orthodoxy and orthopraxis) as well as their historiographical representation. Both mirror major continuities and discontinuities in the history of Christianity. This type of research combines specialized and internationally unique, multidisciplinary expertise.

### Transformation of Religion within the Frameworks of Modernity

The aim of this group is to investigate the effects of social and cultural transformation on the normative quality of religious interpretative systems. Research topics include: 1) the crisis of theism in modernity, 2) science and theology, 3) conflict and cohesion, and 4) chronology and topography. Research focuses in particular on two topics: 'Evil, modernity, and the making of tradition' and 'The problem of divine and human agency within a scientific world view.'

# Research Institute for Philosophy, Theology and Religious Studies

Dr Gert-Jan van der Heiden (Assistant Professor) was elected to the Dutch Royal Academy's prestigious Young Academy (De Jonge Akademie). His Veni project focuses on *Conflicting Pluralities* in society.



## *Religious Identity Transformation in Context*

This group develops theories about the transformation of religious identity within a pluralizing and individualizing context that involves various types of interactions between religions. Transformation of religious identity is studied as a continuity or discontinuity of religious identity in time, through adaptation within its current contexts, and within an explanatory framework of its antecedents and consequents.

## **Research facilities**

The faculty library, which is integrated in the central humanities library, houses an excellent collection of books and journals on philosophy, theology and religious studies. In addition, it possesses several special collections such as the Egyptological collection of books named after the Nijmegen professor J.M.A. Janssen, which is considered to be one of the richest in the Netherlands, and the collection of the Titus Brandsma Institute, a fine collection of books and journals on spirituality and mysticism. The library also houses one of the world's largest microfilm collections of medieval and Renaissance manuscripts on logic, semantics, natural philosophy and metaphysics.

## **Collaboration**

Individual researchers participate in research schools such as the Netherlands Research School for Medieval Studies and the Netherlands Research School for Practical Philosophy. The institute also participates in the Netherlands School for Advanced Studies in Theology and Religion (NOSTER) and the Netherlands Inter-university School for Islamic Studies (NISIS).

The Institute as such also has formal cooperative agreements with the University of Leuven, the University of Stellenbosch, and the University of Münster, which also participates in the International

Research Universities Network (IRUN). There are similar arrangements with the Università degli Studi di Parma, the University of Pretoria, De Paul University (Chicago), the University of Sao Paolo, the Catholic University of America (Washington), the University of South Africa (UNISA Pretoria, South Africa), the University of Dar es Salaam (Tanzania), the Faculty of Theology of Dharmaram Vidya Kshetra in Bangalore (India), the University of Heidelberg, the University of the Philippines in Manila, and the Gadjah Mada University in Yogyakarta (Indonesia).

In addition, members of the philosophy programmes have close contacts with institutions such as the Departments of Philosophy at the Universities of Middlesex and Hertfordshire, Antwerp, Stuttgart and Tübingen, the Humboldt University Berlin, the Università degli Studi di Macerata, the Université de Fribourg, Fordham University and Columbia University (New York), the Centre for Applied Political Philosophy and Ethics at the University of Brighton, and the Centre of Excellence 'History of Mind Research Unit' at the University of Helsinki. In 2010, the Institute hosted guest researchers from a number of countries.

The researchers of the theology and religious studies programme collaborate closely with several Nijmegen-based institutes such as the Institute of Eastern Christian Studies, the Titus Brandsma Institute, the Nijmegen Institute of Mission Studies and the Center for Thanatology.

## **Research results**

In 2010, eleven PhD theses were defended, three *cum laude*: Delphine Bellis, *Le visible et l'invisible dans la pensée cartésienne*, Joas Wagenaars, *A quietist Jihadi-Salafi*, and Lia van Aalsum, *Lied van de eenheid*.

### *Cognition, Interpretation and Context*

A new theory has been developed by Prof. Marc Slors on the nature of our ability to understand the behaviour of others in terms of beliefs and desires: we ascribe beliefs and desires only in *post-hoc* recounting of more direct and intuitive assessments of others. Prof. Slors also formulated a new theory of the function of consciousness in view of recent neuroscientific evidence to the effect that most of our actions are caused unconsciously: conscious decisions are a form of 'self-priming' that results in unconscious actions that match our decisions. The theory makes an important contribution to the debate on the societal impact of neuroscientific claims concerning free will. In the project on quantity implicatures (*Quantity matters*), Dr Bart Geurts and his colleagues obtained new empirical and theoretical results concerning the interpretation of scalar expressions and the long-standing philosophical problem of free choice permission. Veni fellow Dr Corien Bary is currently developing a novel logico-semantic framework to explain how people interpret time-related expressions in natural language. Two book publications stand out: Dr Bart Geurts' *Quantity Implicatures* (Cambridge University Press) and the Chinese translation (进化思维) of Dr Chris Buskes' best selling *Evolutionair Denken* (*Evolutionary Thinking*). What's more, two international conferences were organized. In collaboration with Dr Cees Leijenhorst (*From Natural Philosophy to Science*) and Dr Veronica Vasterling (*The Project of a Hermeneutic Philosophy*), Prof. Marc Slors organized a conference on *The Cartesian Myth of the Ego and the Analytic/Continental Divide*. Together with Prof. André Lardinois, Dr Corien Bary and Prof. Rob van der Sandt organized an interdisciplinary conference on relating theories in formal semantics to Ancient Greek linguistics.

### *The Project of a Hermeneutic Philosophy*

Dr Gert-Jan der Heiden published a book that shows the importance of the notions of disclosure and displacement for an understanding of the relationship between truth and language in contemporary hermeneutic philosophy. In addition, he examined how the plurality of languages and the relationship of source with target languages is conceptualized in hermeneutic accounts of translation. He was elected to the Dutch Royal Academy's prestigious Young Academy (De Jonge Akademie). Together with Dr Tomas Geyskens, Prof. Philippe Van Haute published a book on clinical anthropology in Freud and Lacan. This book shows that the classical interpretation of the abandonment of the seduction theory cannot be accepted. Van Haute was appointed Research Fellow at the Stellenbosch Institute for Advanced Study (STIAS). He also organized the third conference of the International Society for Psychoanalysis and Philosophy. Prof. Paul van Tongeren was appointed Research Fellow at the Netherlands Institute of Advanced Studies (NIAS).

### *From Natural Philosophy to Science*

Dr Michiel Seevinck was awarded a Veni grant for a research project on *Probabilistic Causation in a Spacetime Framework*. Dr Hiro Hirai obtained a Marie Curie Intra European Fellowship (IEF) for a

research project on the concept of *The Cosmic Soul* in Renaissance humanism and natural philosophy. The presence of Prof. Edith Dudley Sylla as a Royal Netherlands Academy of Arts and Sciences (KNAW) visiting professor strengthened work on an edition of John Buridan's commentary on Aristotle's *Physics* – a project led by Prof. Hans Thijssen that involves a number of other researchers, including Prof. Paul Bakker and Dr Michiel Streijger. Dr Streijger, Prof. Bakker and Prof. Thijssen also published their critical edition of John Buridan's *Quaestiones super libros 'De generatione et corruptione'* Aristotelis. Prof. Bakker was appointed Research Fellow at the Netherlands Institute of Advanced Studies (NIAS). Dr Carla Rita Palmerino, with Dr Sophie Roux (Grenoble), published a challenging double fascicle of the international journal *Early Science and Medicine*, which examines the various *Forms of Mathematization* in the philosophical and scientific disciplines from the fourteenth to the seventeenth century. Prof. Christoph Lüthy co-organized the international symposium of the interfaculty research programme *Text, Transmission and Reception* (TTR), a joint initiative of the Faculty of Philosophy, Theology and Religious Studies, and the Faculty of Arts.

### *Ethos, Polis and Religion*

Researchers involved in this programme participated in a Volkswagenstiftung-funded project on orthodox Christianity and European integration (*Alte Grenzen – Neue Fronten*). The articulation of virtue ethics for contemporary society, including its application within specific professions such as police work and education, resulted in an edited volume on *Deugdethiek en integriteit (Virtue Ethics and Integrity)*. A project on the relationship between Islam and democracy yielded a report for NWO, and is the starting point for cooperation with the research group engaged in Islam and Arabic Studies. Researchers working on the NWO-financed research project *Repertoires of Democracy* organized an international conference on *Vectors of Transfer*.

### *Trajectories of Religiosity*

Researchers involved in the project *Refiguring Death Rites* – led by Prof. Eric Venbrux – examined new ritualizations of death and notions of religiosity. Joanna Wojtkowiak, MA and Prof. Venbrux specifically focused on the religious practices of the religiously unaffiliated, centring on the phenomenon of communication with the dead. Dr Thomas Quartier completed his research on new mourning rituals in a Dutch context and presented the results of a project on deathbed rituals. Prof. Venbrux co-edited a volume on comparative mythology, another on ritual, media, and conflict (to be published by Oxford University Press) and a special issue of *La Ricerca Folklorica* on performance in intercultural encounters. Prof. Peter Nissen showed that understanding the afterlife ('longing for heaven') was crucial to new forms of religiosity in the nineteenth century. Dr Frans Jespers published *Fieldwork in Religion* on new forms of religiosity. Prof. Paul van der Velde published his book on the spiritual career of the Siddhartha Gautama, which is central to Buddhism. Prof. Harald Motzki provided a new dating for the

# Research Institute for Philosophy, Theology and Religious Studies

## Key publications

Ackermans, J.E.A. (2010). Einige rechtliche und theologische Fragen zu den Abelitae in Augustins 'De Haeresibus'. In J. van den Berg et al. (Ed.), *In Search of Truth. Augustine, Manichaeism and other Gnosticism. Studies for Johannes van Oort at Sixty* (Nag Hammadi and Manichean Studies, 74) (pp. 123-138). Leiden: Brill.

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Bocken, I.M.K. & Borsche, T. (Eds.). (2010). *Kann das Denken malen? Philosophie und Malerei in der Renaissance*. München: Fink Verlag.

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Heiden, G.J. van der (2010). *The Truth (and Untruth) of Language: Heidegger, Ricoeur, and Derrida on Disclosure and Displacement*. Pittsburgh: Duquesne University Press.

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Lüthy, C.H. (2010). Centre, Circle, Circumference: Giordano Bruno's Astronomical Woodcuts. *Journal of the History of Astronomy*, 41, 311-327.

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Müller, D.A.T. (2010). Les historiens et la question de la vérité historique: L'Eglise cathare a-t-elle existé? In A. Brenon (Ed.), *1209-2009, cathares: une histoire à pacifier?* (pp. 139-154). Portet-sur-Garonne: Loubatières.

Nissen, P.J.A. (2010). Het verlangen naar de hemel. Culturele representaties van oude en nieuwe vormen van religiositeit in de negentiende eeuw. *De Negentiende Eeuw*, 34(2), 113-124.

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Rezetko, R.C. (2010). The Spelling of 'Damascus' and the Linguistic Dating of Biblical Texts. In Vol. 24. *Scandinavian Journal of the Old Testament* (pp. 110-128).

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Wagemakers, J. (2010, november 16). *A quietist Jihadi-Salafi: the ideology and influence of Abu Muhammad al-Maqdisi*. Radboud Universiteit Nijmegen (XXIV, 307 pag.) (S.l.: s.n.). Prom./coprom.: prof. dr. H. Motzki & dr. R. Meijer.

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Wojtkowiak, J., Rutjens, B. & Venbrux, H.J.M. (2010). Meaning making and death: A Dutch survey study. *Archives for the Psychology of Religion*, 32, 363-373.

Zweerde, E. van der & Brüning, A. (Eds.). (2010). *Orthodox Christianity and Human Rights* (Eastern Christian Studies). Leuven: Peeters.

Dissertations:	11
Scientific publications:	202
Professional publications:	96

origin of Muslim Qur'ân exegesis in his book *Analysing Muslim Traditions*. Dr Martijn de Koning developed a new approach to the study of the Salafi movement as a utopian movement. The book edited by Dr Roel Meijer on *The Muslim Brotherhood in Europe* makes a scholarly contribution to the debate on Islam and Islamic movements. Dr Karin van Nieuwkerk edited *Muslim Rap, Halal Soaps and Revolutionary Theater*, a volume on new artistic developments in the Muslim cultural sphere. Dr Elisabeth Hense published *Frühchristliche Profilierungen der Spiritualität*, a book on the 'discernment of the spirits', an important leitmotiv in Christian spirituality.

*Biblical Studies, Ancient Judaism, Early Christianity, and Gnosticism*  
Prof. Ellen van Wolde continued to concentrate on cognitive linguistic research of the conceptual transformations reflected in the Hebrew bible in its ancient Near Eastern context. Her book *Reframing Biblical Studies* was discussed at various international meetings. Dr Robert Rezetko's work on the linguistic possibilities for dating biblical texts that mirror religious transformations led to a lively debate on dating issues in Biblical Hebrew linguistics. Dr Rezetko's publication of a landmark article on 'The Spelling of "Damascus" and the 'Linguistic Dating of Biblical Texts' strengthened his position in this field. In New Testament studies, Prof. Jan van der Watt extended his research to include 'John and ethics', examining the way exegetical research can help when formulating positions in modern ethics.

#### *Transformations of the Concepts, Practices and Representation of Discipline in Christianity*

Prof. Daniela Müller focused her research on the transformation of medieval concepts of guilt, punishment and penance, and on the use of discourse analysis (as developed by the French philosopher Michel Foucault) in interpreting the sources of the Inquisition(s). She brought to light some widespread fallacies in the current geographical limitations of this research and in the patterns of the historiographical interpretation of some of the most prominent sources of the Inquisition(s). She presented her findings in several international scholarly articles and in lectures at international conferences.

*Transformation of Religion within the Frameworks of Modernity*  
Dr Ria van den Brandt successfully completed her VWS Oral History Project *Witnesses of Theresienstadt*, which generated new sources of research and new insights into the coping strategies of Dutch survivors of Theresienstadt. She organized – in collaboration with the Soeterbeeck Programme – the 2010 Holocaust Memorial Day. She also co-edited *Spirituality in the Writings of Etty Hillesum and authored Etty Hillesum. Amicizia, ammirazione, mistica*. Dr Marc De Kesel organized a well-attended international expert seminar on *Imagining/Remembering the Shoah*, which investigated the complex role of imagination in the commemoration of the Holocaust, focusing on the work of the famous Israeli author David Grossman.

# Research Institute for Philosophy, Theology and Religious Studies

## *Religious Identity Transformation in Context*

Prof. Chris Hermans and Dr Carl Sterkens developed an empirically tested model of vertical mysticism that can be used in comparative research between religions. The EURESOURCE programme *Religious Sources of Solidarity* – led by Profs. Hans Schilderman and Peer Scheepers – was successfully concluded. An analysis of previously collected large-scale data allowed researchers to determine the extent to which religiosity is a source of solidarity in European countries. Prof. Frans Wijsen co-edited the *Dictionary of Literary Swahili*. His book *There is only one God* was translated in Indonesian with the challenging title (translated into English) *Fruits of the Spirit. How to do participatory research in the countries of the Southern hemisphere*. The book is used in courses that introduce Indonesian students to research methods in religious studies. Finally, Prof. Hans van der Ven finished his book on *Human Rights or Religious Rules*, which offers a systematic and historical analysis of the contested relationship between religion and human rights.

## **Societal impact**

Members of the Institute regularly participate in forum discussions and contribute to public debate by publishing articles in newspapers, giving talks on the radio and in other media.

Prof. Paul van Tongeren and Dr Marcel Becker produced a DVD on integrity as a virtue of civil servants. During the traditional Dutch 'Month of Philosophy', Prof. Christoph Lüthy took part in several debates on the theme of the 'maakbare mens' ('malleable man'). Dr Bas van Stokkom published a book under the thought-provoking title *Wat een hufter! (What a thug!)*, which gave rise to public debates in newspapers and on television. The MA students involved in the Royal Academy's *Student Assistants Programme on Limits and Chances in the Dialogue between Reason and Religion* presented their results in a book edited by Dr Marin Terpstra and Dr Inigo Bocken. During a final conference, the students presented the idea of a dialogue between reason and religion from different perspectives, employing a variety of performative strategies. The Faculty's philosophy section and the Soeterbeeck Programme organized the 32<sup>nd</sup> conference of Dutch and Flemish philosophers ('Nederlands-Vlaamse Filosofiedag'). The theme of the conference was the question of the value and usefulness of philosophy as an academic discipline in 21<sup>st</sup>- century society. The conference attracted an audience of around 200 people.

Prof. Frans Wijsen co-edited *Indigenous Voices in the Sustainability Discourse* (together with Sylvia Marcos), a volume that will help co-funding agencies to understand the relationship between religion and development. Dr Karin van Nieuwkerk and collaborators organized a cultural activity together with LUX theatre and Elan (an expert centre for integration, emancipation and participation). Several researchers in the group engaged in Islam and Arabic Studies were involved in the Islam Research Project (IRP), which focuses on Saudi Arabia. The 2010 Radboud Science Award went to Prof. Ellen van Wolde. She will use these funds to develop an educational

project in collaboration with elementary schools in the Arnhem- Nijmegen region. A documentary on the work of Ellen van Wolde, an initiative of the Royal Academy of Arts and Sciences (KNAW) and the TV channel HUMAN, was made by John Appel and broadcast on national television. Dr Marc De Kesel published a book on monotheism (*Goden breken*), which became a theological bestseller, leading to many newspaper and magazine interviews, and an interview for VPRO's TV programme Boeken. Prof. Palmyre Oomen and Dr Taede Smedes published the volume *Evolutie, Cultuur en Religie (Evolution, Culture and Religion)*, which contains contributions by members of the Faculty of Philosophy, Theology and Religious Studies and the Faculty of Science. Prof. Oomen also co-edited a volume on *Nanotechnologie*, which led to interviews on both radio and television, as well as to many invited lectures at conferences on nano-technology.

## **Future research**

On 1 January 2011, the Research Institute for Philosophy and the Research Institute for Religious Studies and Theology merged into one Research Institute for Philosophy, Theology and Religious Studies. Within this new environment, the current research programmes are being evaluated in order to increase the coherence and sharpen the focus of research. The Research Institute for Philosophy, Theology and Religious Studies will continue cooperation with the Institute for Historical, Literary and Cultural Studies (HLCS) and the Centre of Language Studies (CLS), in order to reinforce research in the humanities at Radboud University Nijmegen.

Prof. Marc Slors and his collaborators will develop and expand two current lines of research: conscious deciding as self-priming and mind as reconstructive modelling. Dr Bart Geurts and collaborators will continue their research on pragmatic inferencing, presupposition and the theory of mind. Dr Corien Bary will continue to work on her Veni project *Reports from the Past*.

Dr Gert-Jan van der Heiden will focus on his Veni project on *Conflicting Pluralities* for the next two and a half years. Prof. Ben Vedder plans to work on the relationship between hermeneutics and philosophy of religion, while Dr Gerrit Steunebrink will work on Hegel and intercultural philosophy. Prof. Philippe Van Haute will be a fellow at STIAS until 2013, where he will be working on a multi-author publication on *The project of a clinical anthropology*. Dr Benda Hofmeyr continues her Veni project on *Radical Passivity*. Prof. Paul van Tongeren will continue research in connection with the *Nietzsche Wörterbuch*.

The 12½-year jubilee of the *Center for the History of Philosophy and Science* (which is the name by which the research programme *From Natural Philosophy to Science* is known internationally) will be celebrated by a series of international conferences. Prof. Lüthy will bring the NWO Programme *Visualizing the Invisible* to a close by organizing an international conference on the evolution of

## Director: Prof. Paul Bakker

Paul Bakker has been a Full Professor of Medieval and Renaissance Philosophy at Radboud University Nijmegen since 2008. His current research focuses on the tradition of commentaries on Aristotle's *De anima* (from the late Middle Ages until the seventeenth century) and specifically on the methodology of the science of the soul and its impact on views concerning the relationship between soul, mind and body. He is also interested in the institutional setting of Medieval and Renaissance university teaching and in manuscript studies. Bakker is a member of the board of the Société Internationale pour l'Etude de la Philosophie Médiévale.



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scientific imagery in the early modern period. Furthermore, a book entitled *Silent Messengers* on the circulation of scientifically relevant objects in the early modern period, edited by Prof. Lüthy and Prof. Sven Dupré (Ghent/Berlin), will be published in March 2011. Dr Cees Leijenhorst and Prof. Paul Bakker will publish *Psychology and the Other Disciplines*, a collection of essays on the development of the science of the soul from the late Middle Ages to the eighteenth century. Dr Hiro Hirai will publish a monograph on *Medical Humanism*. Dr Michiel Seevinck will spend four months as a visiting fellow at the University of Sydney.

In the research programme *Ethos, Polis and Religion*, several new research initiatives will be launched. One is the research line developed by Prof. Jean-Pierre Wils on *City, Garden and Desert* as three main metaphors in conceptualizing the political community. Another is a joint project with the universities of St. Gall and Fribourg (Switzerland) and the RSUH in Moscow on the relationship between democracy, human rights, national identity and religion in three non-EU European countries (Georgia, Armenia, and Azerbaijan). A research project on Orthodox Christianity and European Integration will conclude with a conference in Brussels. In 2011 several books are due to appear: a volume on *Orthodox Christianity and Human Rights*, a volume on Crises of Democracy, and a monograph by Dr Marin Terpstra on *Democratie als cultus (Democracy as a Cult)*. Several members of the programme will contribute to a collective volume on political philosophy, edited by Terpstra, as part of the *Basisboek Filosofie* series published by Boom.

Researchers in the *Trajectories of Religiosity* group intend to work on new forms of religiosity of a holistic nature, comparative research into changing ways of dealing with death in Europe and research on Western forms of Buddhism and Hinduism. The related Centre for Thanatology will host the prestigious international conference on the social context of death, dying and disposal (DDD10) in cooperation with the (British) Association for the Study of Death and Society (ASDS). Prof. Harald Motzki will start a new research project on the sources of the *Sira*, the earliest biography of the prophet Muhammad. The aim is to date and evaluate the historical reliability of these sources.

Prof. Daniela Müller and Dr Gian Ackermans will organize an international expert seminar on the history and historiography of various dualistic groups in ancient and medieval Christianity. Dr Ackermans will continue his research on the legal-historical aspects of the voluntary leave of members of institutions of religious life. He will publish a monograph on the life and works of 20<sup>th</sup>-century Dutch canonists from the Order of Friars Minor.

Prof. Georg Essen will spend his sabbatical leave as a visiting scholar at Stanford University to do research in the field of *Discourses on Modernity in Catholic Theology*. Prof. Palmyre Oomen will conclude an English monograph on A.N. Whitehead's philosophy and the significance of his concept of God in a secular-scientific context.

# Institute for Historical, Literary and Cultural Studies

The Institute for Historical, Literary and Cultural Studies (HLCS) is part of the Faculty of Arts. Its main objective is to create a stimulating research environment for high-quality, innovative research in the fields of literature and literary theory, cultural studies, history, art history and archaeology. HLCS research is organized in programmes that are based on common research issues, themes, methodologies or a common focus on a specific period. Each programme is designed to maximize integration through joint projects. Thanks to initiatives designed to strengthen the Institute's profile – by combining expertise and making a clear choice for high-level research and talent – HLCS ensures that its research remains prominent both nationally and internationally.



There are four research programmes:

## *The Ancient World*

The Ancient World is an interdisciplinary programme in which classicists, ancient historians and archaeologists study ancient Greek and Roman civilization and its reception from the Middle Ages until the present day.

## *Memory: Cultural and Religious Identities*

Scholars in this interdisciplinary programme explore how people in various historical and cultural settings construct their identity by actively recollecting, shaping, re-shaping and mediating the past.

## *Public and Private life: the History of Politics and Human Life Courses*

This programme tackles the long-term developments in politics, economy and culture of Dutch, European and Asian societies.

## *Studying Criticism And Reception Across Borders (SCARAB)*

SCARAB focuses on the role of literary professionals, such as book reviewers and critics, and institutions, periodicals and societies,

as well as printing and publishing firms – as 'bearers' of literary culture and instrumental in the production, dissemination and consumption of literary culture over the centuries.

## **Awards**

Dr Bé Breij received the Keetje Hodshon Prize for her dissertation on *The Eighteenth and Nineteenth Major Declamations Ascribed to Quintilian: A commentary* (published in 2007), and for her other academic strengths. The Keetje Hodshon Prize is awarded by the Royal Holland Society of Sciences and Humanities to encourage young researchers.

## **Research facilities**

- The Humaniora Library (155,000 volumes, 15,500 serial volumes, 750 serial subscriptions and 600 manuscripts)
- Catholic Documentation Centre: archives and publications of Catholic institutions and individuals in the Netherlands, 1800-2000 ([www.ru.nl/kdc](http://www.ru.nl/kdc))
- Centre for the Documentation of Art History: collections of pictures, photographs, and slides ([www.ru.nl/ckd](http://www.ru.nl/ckd))



## Staff

Prof. R.A.M. Aerts (o)  
Prof. C.C. van Baalen (p)  
Prof. J.T.J. Bak (o)  
Prof. C.M.G. Berkvens-Stevelinck (e)  
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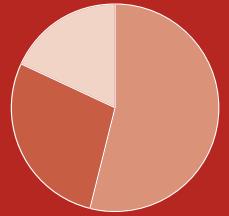
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Prof. A.C. Tilroe (e)  
Prof. T.H.G. Verhoeven (e)  
Prof. K.G. de Vries (e)

### Tenured

Full Professors	9.7 FTE
Assistant Professors	10.0 FTE
Researchers	7.3 FTE

### Non-tenured

Researchers	8.7 FTE
Doctoral candidates	26.7 FTE



FTE 1<sup>st</sup>  
FTE 2<sup>nd</sup>  
FTE 3<sup>rd</sup>

- The Auxilia archaeological project bureau (Provincial Roman History; excavations in the former territories of Germania Inferior, especially in Ulpia Noviomagus Batavorum ([www.ru.nl/auxilia](http://www.ru.nl/auxilia)))
- Kunera: a database of medieval pilgrim badges and other souvenirs ([www.let.kun.nl/ckd/kunera/](http://www.let.kun.nl/ckd/kunera/)).

## Collaboration

Prof. Olivier Hekster and Dr Gerda de Kleijn are members of the executive board of the International Network 'Impact of Empire', which studies the Roman Empire and the consequences of its actions for the regions it dominated. The network is directed by an international board of highly respected scholars drawn from the Classics, Archaeology, Ancient History, and History of Law from the universities of Amsterdam (Free University), Brussels (Free University), Groningen, Heidelberg, Leiden, Metz, Münster, New York, Nijmegen, North Carolina, Nottingham, Oxford, Paris (Sorbonne), Rome (La Sapienza) and Toronto. Prof. Hekster chairs this board.

Prof. André Lardinois is one of the founders of a network engaged in the study of archaic Greek lyric, iambic and elegiac poetry and song, with representatives in most European countries as well as from the main American universities. The aim of this network is to pool the resources of individual scholars, who now often work in isolation, by holding regular meetings, keeping in contact through a network website and a newsletter, and defining topics of common interest within archaic Greek poetry that groups of scholars in different countries can work on together.

Dr Stephan Mols has been elected president of the board of the Association Internationale pour la Peinture Murale Antique (AIPMA), an international network of researchers working on ancient wall painting. The board organises conferences and publishes a bibliographical Bulletin entitled Apelles. Prof. Moormann, who is also part of this network, is collaborating on the current edition of this bulletin.

# Institute for Historical, Literary and Cultural Studies



Prof. Marit Monteiro (Full Professor) and Prof. Dolly Verhoeven (Extraordinary Professor) studied the education and shaping of Roman Catholic intellectual elites (1920-1970). They organized a symposium, exposition and interactive website on these so-called *Bearers of promise*.

Prof. Marit Monteiro is a member of the board of RELINS-Europe (European Forum on the History of Religious institutes in the 19<sup>th</sup> and 20<sup>th</sup> centuries), a collaborative venture between KADOC Leuven, Universität Fribourg, Hochschule Vallendar and Radboud University Nijmegen.

Prof. Theo Engelen is director of a joint venture involving historians and anthropologists at the N.W. Posthumus Instituut, Stanford University and Academia Sinica (Taiwan) called 'Population and Society in Taiwan and the Netherlands'.

Prof. Carla van Baalen is a member of the board of the Montesquieu Institute, which studies comparative European parliamentary history and constitutional development in The Hague. The Institute collaborates with other research centres and institutes in Europe on research and educational programmes that focus on parliamentary history, political culture, and political relations and developments in the EU member states and the European Union.

Prof. Anneke Smelik collaborates with ArtEZ Institute of the Arts in Arnhem, the Saxion Universities, the Premsela Institute for Fashion and Design, the Amsterdam Fashion Institute and the University of Amsterdam in the Netherlands Organisation for Scientific Research (NWO)'s Cultural Dynamics programme 'Dutch fashion in a globalised world'.

## Research results

In 2010 twelve dissertations were defended, including one cum laude: Floris Overduin, *Nicander of Colophon, Theriaca: A Literary Commentary*.

Archaeologist Dr Miko Flohr studied the work of *fullones*, textile workers in Rome, Ostia and Pompeii in the first three centuries AD. In some places, he discovered, the work was organized in an unexpectedly efficient large-scale way and was clearly designed to maximize profits. In history, similar rational production processes were not seen until the Industrial Revolution. Flohr: 'It was already known that the Romans reflected on the efficient organization of work, but until now we were unaware of the fact that it was elaborated this much.'

Dr Hans Kienhorst is one of the editors of the first critical edition of the *Codex Wiesbaden*, which was presented in February 2010. The codex contains a collection of fourteenth-century texts on religious matters such as catechetical instruction and lay spirituality, recorded around 1410 in the Flemish-Brabant border area. Remarkable is the fact that these texts are written in the vernacular and not in Latin, the language in which ecclesiastical knowledge was normally written down in those days. The codex was probably compiled by a group of laymen who led a devout religious life. Almost all of the Middle Dutch texts we know of were once part of a codex. For many years it was custom to publish the most special ones separately, but nowadays researchers are convinced that, in order to study texts in their context, they must be edited as a whole.

The Netherlands Geographic Information System (NLGis) has published a website ([www.nlgis.nl](http://www.nlgis.nl)) – a tool that supports the spatial component of historical research in which historians can visualise regional variation in Netherlands municipal data. Such variations can be beautifully displayed by means of a geographic information system. In this project, which is led by Dr Onno Boonstra, a user-friendly web application has been developed

which makes this kind of display possible. Researchers can now upload municipal data from the period 1812 to 2000, display it and then download maps generated with the aid of NLGis.

Take any year and describe how Dutch culture in that year was influenced by foreign art and international contacts in the art world. That is the idea behind *In 1934. Nederlandse cultuur in internationale context*. *In 1934* discusses expressions of Dutch culture as part of European culture, with an emphasis on literature. How were Dutch developments in and debates on literature interwoven with those abroad? What were the European influences on Dutch writers, critics, editors, publishers and agents and what influence did they themselves have on foreign literary developments? *In 1934* was written by members of the 'International reception' project, which is associated with the Huygens Institute in The Hague, Utrecht University and Radboud University Nijmegen. It was edited by Dr Helleke van den Braber and Dr Jan Gielkens of the Huygens Institute.

### Societal impact

Dr Vincent Hunink has translated Tacitus' *Historiae*. The Roman historiographer Tacitus (ca 55-120) wrote his Histories on the complexities of the 'Year of Four Emperors' (69-70 AD), when the Roman Empire was afflicted by cruel civil wars. The work is popular as well as infamous among readers and translators for its grim style and extremely dense Latin; Hunink's reproduction is angular and intractable, concise and poetical, precisely to reflect Tacitus' style. The translation is therefore, in Hunink's own words, not easy to read, but well worth the effort. A second and third edition appeared in 2010.

Between 1920 and 1970 tens of thousands of boys and girls were trained in Catholic grammar schools and preparatory seminaries to become an intellectual elite that would put a Catholic stamp on multi-denominational Netherlands. But things turned out differently: the intended Catholic elite were often involved in precisely the opposite: the 'depillarization' of the country. These 'bearers of promise' were highlighted in a symposium, which explored the question as to what extent religious schooling contributed to the fact that many pupils eventually dissociated themselves from their Catholic background. An exhibition on the same topic was held in Museum de Stratemakerstoren in Nijmegen and an interactive website ([www.dragersvanelofte.nl](http://www.dragersvanelofte.nl)) was created to facilitate contact between these individuals.

In the night of 13 to 14 October in 1966 the government of Prime Minister Jo Cals (KVP; Catholic Popular Party) fell over a motion by his Catholic colleague – and leader of the KVP in the Dutch parliament – Norbert Schmelzer. The 'Night of Schmelzer' has since been seen as the beginning of a period of polarization in Dutch politics. It also led to considerable turmoil within Christian Democratic ranks: radical members of KVP and ARP left their

### Centre for Parliamentary History

Director: Prof. Carla van Baalen

[www.ru.nl/cpg](http://www.ru.nl/cpg)

HLCS houses the Centre for Parliamentary History (known by its Dutch abbreviation, CPG), in which researchers study Dutch parliamentary history since the Second World War. Results from this research are published in the series 'Parlementaire Geschiedenis van Nederland na 1945' (Dutch parliamentary history since 1945) and the annals of parliamentary history from 1999 onwards.

parties and founded the PPR (Political Party of Radicals). *Rondom de Nacht van Schmelzer* gives short shrift to the suggestion that the night in question revolved around a struggle for power between the two fellow party members. Schmelzer's goal was not to succeed Cals as prime minister. His main concern, alongside the national interest – and in particular a sound budget – was the interest of the party. *Rondom de Nacht van Schmelzer* is the eighth volume in the series 'Parliamentary History of the Netherlands after 1945' of the Centre for Parliamentary History.

### Future research

In the summer of 2010, a student team lead by Dr Stephan Mols and Prof. Eric Moormann began documenting the monuments situated along a 1500-meter stretch of the Via Appia outside Rome. These monuments are located about 7 kilometres south of the centre of Rome on what in ancient times was called the fifth and the sixth mile. Along the road were funerary monuments, workshops and villas, mostly built by rich clients and used by several generations. The objective of the project is to study the monuments in their immediate surroundings as well as over a long period of time. Whereas previous studies mostly focused on particular monuments or periods, this study aspires to present a complete picture of the road and its environment. In order to do so, a multidisciplinary team was formed composed of experts from the Royal Dutch Institute in Rome, VU University Amsterdam and Radboud University Nijmegen. The monuments are charted and drawn with the help of GPS and the area on both sides of the road is researched using various geo-physical methods and surface surveys. Starting in 2011, excavations will be carried out in several places along the route. The first field-work campaigns took place in the summers of 2009 and 2010 and the project will continue for several more years.

The European Research Council awarded a 'Starting Grant' to Dr Marguérite Corporaal for her research on the cultural memory of the Great Potato Famine of 1845-1849 in Irish literature and diaspora literature published between 1847 and 1921. This famine radically

# Institute for Historical, Literary and Cultural Studies

## Key publications

Aerts, R.A.M. (2010). Civil Society or Democracy? A Dutch Paradox. *Bijdragen en Mededelingen betreffende de Geschiedenis der Nederlanden*, 125(2), 209-237.

Braber, H.M. van den & Gielkens, Jan (Eds.). (2010). *In 1934. Nederlandse cultuur in internationale context*. Amsterdam: Querido.

Derkx, M.E.B. & Dols, C.F.H.A. (2010). Sprekende cijfers. Katholieke sociaalingenieurs en de enscenering van de celibaatcrisis, 1963-1972. *Tijdschrift voor Geschiedenis*, 123(3), 414-429.

Heiden, P.B. van der & Kessel, A.C.M.W. van (Eds.). (2010). *Rondom de Nacht van Schmelzer. De kabinetten-Marijnen, -Cals en -Zijlstra 1963-1967* (Parlementaire geschiedenis van Nederland na 1945, 8). Amsterdam: Boom.

Hekster, O.J. (2010). Reversed Epiphanies: Roman Emperors Desereted by Gods. *Mnemosyne. A Journal of Classical Studies*, 63(4), 601-615.

Jensen, L.E., Leerssen, J. & Mathijsen, M. (Eds.). (2010). *Free access to the past. Romanticism, cultural heritage and the nation* (National cultivation of culture, 2). Leiden: Brill.

Joosten, J.H.T. (2010). 'Toch is het niet altijd even hoogstaand en prijzenswaardig': Nederlandstalige literatuurkritiek op het internet. *Spiegel der Letteren*, 52(1), 85-108.

Kok, J. & Bavel, J. van (Eds.). (2010). *De levenskracht der bevolking. Sociale en demografische kwesties in de Lage Landen tijdens het interbellum*. Leuven: Universitaire Pers Leuven.

Kouwenberg, A.J.A. (2010). 'De kennis der Duitsche taal is voor een geleerden hedendaags onontbeerlijk.' *Duitse natuurwetenschappen en pedagogie in Nederlandse genootschappen rond 1800*. Radboud Universiteit Nijmegen (x, 270 pag.) (Amsterdam: APA-Holland University Press). Prom./coprom.: prof. dr. A.J.A.M. Hanou, prof. dr. G.C.A.M. van Gemert & dr. I.B. Leemans.

Lardinois, A.P.M.H. (2010). Lesbian Sappho Revisited. In Jitse Dijkstra, Justin Kroesen & Yme Kuiper (Eds.), *Myths, Martyrs, and Modernity. Studies in the History of Religions in Honour of Jan N. Bremmer* (Numen book series, 127) (pp. 13-30). Leiden: Brill.

Linders, Y.F.M. & Op de Beek, E.A. (2009). Evaluatiedomeinen in de Nederlandse literatuurkritiek. In Wilbert Spooren, Margreet Onrust & José Sanders (Eds.), *Studies in taalbeheersing* (pp. 247-258). Assen: Van Gorcum.

Mols, S.T.A.M. & Moormann, E.M. (2010). L'edificio romano sotto S. Maria Maggiore a Roma e le sue pitture: proposta per una nuova lettura. *Römische Mitteilungen*, 116, 469-506.

Moormann, E.M. (2010). Fictitious Manuscripts from Herculaneum, Pompeii and Antiquity. *Cronache Ercolanesi*, 40, 239-250.

Plate, L. (2010). *Transforming Memories in Contemporary Women's Rewriting*. Basingstoke/New York: Palgrave.

Schoor, R.J.M. van de (2010). Georgius Cassander: Searching for Religious Peace in his Correspondence (1557-1565). In Jeanine De Landtsheer & Henk Nellen (Eds.), *Between Scylla and Charybdis. Learned Letter Writers Navigating the Reefs of Religious and Political Controversy in Early Modern Europe* (Brill's Studies in Intellectual History, 192) (pp. 127-147). Leiden: Brill.

Dissertations:	12
Scientific publications:	237
Professional publications:	212

## Director: Prof. Eric Moormann

Eric Moormann has been a Full Professor of Classical Archaeology at Radboud University Nijmegen since 2002. Before that he was Assistant Professor at the University of Amsterdam and worked at the Netherlands Institute in Rome. He is an expert in the archaeology of the Hellenistic-Roman era, studying in particular the citizen's environment in ancient times (aspects such as housing, furniture, decoration and city structure). Prof. Moormann has been a Corresponding Member of the German Archaeological Institute since 1998 and is editor-in-chief of the *Bulletin Antieke Beschaving*, a peer-reviewed annual publication on archaeological studies in the Mediterranean region. He received the Winckelmann Medal for his research on this 18<sup>th</sup>-century pioneer scholar of Classical Archaeology.



## Institute for Historical, Literary and Cultural Studies

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transformed Ireland: it led to the wide-scale eviction of farmers, killed one million of the rural population, and resulted in massive emigration. Moreover, the Great Famine stirred up anti-English, nationalist sentiments and its trauma is pivotal to the development of an Irish postcolonial consciousness. There is a vast unexplored transatlantic corpus of prose fiction, which recalls the years of starvation and diaspora. An examination of the corpus will move beyond the largely national frontiers of cultural memory studies towards innovative, transnational approaches.

In 2011, three Vidi laureates will start their projects with HLCS.

**Dr Lotte Jensen: *Proud to be Dutch. The role of war and propaganda literature in the shaping of an early modern Dutch identity, 1648-1815***  
Historical research on Dutch nationalism has mainly focused on the nineteenth century. However, the growth of national thought – the idea that the Dutch belonged to a common community – can be traced back to earlier stages of Dutch history. This project will do just that, by focusing on the role of war and propaganda literature in the period from 1648 to 1815. Such a diachronic approach will enable investigations of developments and changes in the development of Dutch national thought. By exploring the pre-modern period, it will also challenge current international scholarly views on the formation of national identities.

**Dr Brigitte Adriaensen: *The Politics of Irony in Contemporary Latin-American Literature on Violence***

The impact of violence on Latin-American society in the twentieth century has been enormous. Although Latin-American culture has

a long tradition in using irony as a way of approaching violence and its traumatic consequences, the relationship between irony and violence in its literature has never been systematically investigated. This project departs from a minimal definition of irony as an indirect mode of discourse which plays with the distance between two oppositional senses and which has a mainly evaluative function. Irony will not merely be studied as a rhetorical or a narratological tool, but also as a discursive strategy, which takes an ideological stance in relation to historical violence in Latin-America. Although the main aim of this project is to improve our understanding of irony in relation to violence in Latin-American literature, its theoretical scope will enable further implementation in other cultural fields.

**Dr Hilde Bras: *The power of the family. Family influences on long-term fertility decline in Europe, 1850-2010***

Over the last 160 years, a remarkable decline of fertility has taken place in European societies. Intriguingly, there have been – and still are – substantial regional disparities in fertility levels and reproductive change. Previous explanations emphasizing economic development and cultural change have not been able to clarify these differences. Building further on recent approaches that stress the social relationships and interactions that connect individuals to one another, this project zooms in on the place where decisions on procreation are primarily taken: the institution of the family. By combining previous economic and cultural explanations with theories on family influences and the cultural variations that aim of this project is to open up new vistas for understanding long-term population change.

# Research Centres of the Faculty of Law



## **The Business & Law Research Centre (Prof. C.J.H. Jansen)**

The Business & Law Research Centre – *Onderzoekcentrum Onderneming & Recht (OO&R)* – involves cooperation between the Law Faculty of the Radboud University Nijmegen and fourteen prominent, mostly international, law firms and Dutch multi-nationals: ABP Pension Funds, AEGON NV, AkzoNobel, Allen & Overy, De Brauw Blackstone Westbroek, Clifford Chance, Eumedion, Houthoff Buruma, ING, Loyens & Loeff, Nauta Dutilh, Pels Rijcken & Droogleever Fortuijn, Rabobank Netherlands and Stibbe. These partners are extensively involved in the research of the Centre. They also participate in the Advisory Board, providing recommendations on the governance, focus and prospective research projects of the Centre.

The Centre, which conducts fundamental research in Business and Law, critically analyses national and international developments in

legislation, case law and best practice related to this field. It also provides a thorough educational programme for gifted young scholars and is actively involved in a wide variety of postgraduate educational and professional training programmes.

The Centre combines academic excellence with the expertise and practical experience of its partners. This unique collaboration has led to cross-fertilization between legal practice and the academic world.

The four key research programmes are:

- 1 Company Law
- 2 Banking, Finance and Insolvency Law
- 3 Business and Patrimonial Law
- 4 Business and Financial Law

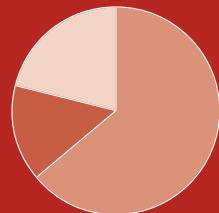
Research focuses strongly on European private law and private international law, complemented by research on the practical

## Staff

Prof. S.E. Bartels (o)	Prof. M.P. Nieuwe Weme (o)
Prof. F.E.J. Beekhoven van den Boezem (e)	Prof. A.G.A. Nijmeijer (o)
Prof. J.M.A. Berkvens (e)	Prof. A.J.M. Nuytinck (o)
Prof. P.P.T. Bovend'Eert (o)	Prof. M. van Olffen (o)
Prof. Y. Buruma (o)	Prof. A.A. Quaedvlieg (o)
Prof. D. Busch (o)	Prof. W.A.K. Rank (o)
Prof. E.C. Coppens (e)	Prof. B.P.M. van Ravels (o)
Prof. D.R. Doorenbos (o)	Prof. J.S.L.A.W.B. Roes (o)
Prof. N.E.D. Faber (o)	Prof. H.J.B. Sackers (p)
Prof. R. Fernhout (e)	Prof. R.J.N. Schlössels (o)
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Prof. L.E. de Groot-van Leeuwen (p)	Prof. F.W.J.M. Schols (o)
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Prof. R.H. Maatman (o)	Prof. P.C. Vegter (e)
Prof. A.J. Machielse (o)	Prof. L.G. Verburg (o)
Prof. T.J.M. Mertens (o)	Prof. H.L.E. Verhagen (o)
Prof. G.T.K. Meussen (o)	Prof. B.P. Vermeulen (p)
Prof. R.E.C.M. Niessen (o)	Prof. K.C. Wellens (o)

Tenured	
Full Professors	10.6 FTE
Associate Professors	5.7 FTE
Assistant Professors	3.1 FTE
Researchers	3.2 FTE
Lecturers	1.1 FTE

Non-tenured	
Researchers	3.7 FTE
Lecturers	8.3 FTE
Doctoral candidates	35.4 FTE



■ FTE 1<sup>st</sup>  
■ FTE 2<sup>nd</sup>  
■ FTE 3<sup>rd</sup>

applications of the law and international, comparative and multi-disciplinary research.

The Centre, which was established in 1991, is recognized as a research school by the Royal Netherlands Academy of Arts and Sciences (KNAW). In 2009, the accreditation was renewed by the KNAW and is now valid until 2015. Its research was evaluated in 2010 by the National Evaluation Committee for Dutch Law Faculties. In general, the positive conclusions reached by the Peer Review Committee and ECOS within the context of the KNAW reaccreditation procedure were confirmed by this committee. The Centre's educational programme for gifted young scholars is certified by the Accreditation Organization of the Netherlands and Flanders (NVAO).

### Research facilities

The Centre houses the Information and Documentation Centre for Business and Law (CIDOR), which has a collection of books,

journals and electronic publications on international and domestic Business Law that is unique in the Netherlands.

### Awards and Acknowledgements

- Prof. C.H. Sieburgh was elected as a member of the KNAW
- Prof. A.S. Hartkamp was elected as a foreign member of the Hungarian Academy of Sciences
- Ms. I.P.M. Ligteringen was awarded the Frye Grant.

### Collaboration

Within the framework of International Working Groups on Company Law, Security Rights, Insolvency Law and Financial Law, the Centre cooperated in 2010 with leading academics from the following universities and research centres: Adelaide (Australia), Bangi – National University of Malaysia (Malaysia), Bar-Ilan (Israel), Basel (Switzerland), Beijing – China University of Politics and Law (China), Berlin – Humboldt (Germany), Bern (Switzerland), Bolzano (Italy), Budapest (Hungary), Cambridge (UK),

# Research Centres of the Faculty of Law

Prof. Elspeth Guild (Full Professor) is an expert on Justice and Migration. She presented the opening lecture at the International Conference *Metropolis* on global migration, integration and citizenship.



Chicago – John Marshall Law School (US), Cuyo (Argentina), Dublin (Ireland), Duke (US), Edinburgh (Scotland), Geneva (Switzerland), Genoa (Italy), Ghent (Belgium), Göthenburg (Sweden), Hamburg – Max Planck Institute (Germany), Johannesburg (South Africa), Kolkata (India), Krakow (Poland), Leeds (UK), Leuven (Belgium), Lund (Sweden), Luxembourg (Luxembourg), Madrid (Spain), Marburg (Germany), Melbourne (Australia), Montpellier (France), Münster (Germany), Nottingham (UK), Örebro (Sweden), Oxford (UK), Paris – Pantheon-Sorbonne (France), Pozna (Poland), Pretoria (South Africa), Prague (Czech Republic), Rome – Luiss Guido Carli (Italy), Rutgers-Camden (US), São Paulo (Brazil), Seoul – Ewha (South Korea), Toledo (Spain) and Toronto – Osgoode Hall Law School (Canada). The Centre also collaborated with INSOL Europe and UNCITRAL.

## Research results

Interdisciplinary and multi-disciplinary research was conducted on several aspects relating to the credit crisis. A volume on this topic published in 2010 includes an economic review of causes, consequences and future remedies and analyses the changing role of public and private shareholders in companies. It also includes an assessment of a possible new financial regulatory framework in the Netherlands and Europe. Special attention is drawn to the position of the security trustee in financial distress and the role of credit rating agencies from an English and comparative legal perspective. The book concludes with an overview of presentations and discussions during a conference organized by the Centre at ING House on the global credit crisis.

Another major topic addressed by the Centre was secured transactions. Important examples include the publication of the inaugural lecture of Prof. F.E.J. Beekhoven van den Boezem on the use of credit claims as collateral within the context of monetary policy transactions in the Euro system. Numerous recent developments and discussions in legal doctrine are addressed in a separate volume on bank security, including public filing of security documentation, new enforcement modes regarding pledged shares and the use of pre-packs in a Dutch legal setting, modification of existing priorities by secured creditors and secured financing of informal restructuring attempts.

Misleading representations in capital market transactions were examined in the doctoral thesis of Dr B.J. de Jong, which was presented during a seminar on the 'World Online' case organized by the Centre at Houthoff Buruma. Papers submitted within the framework of the biennial conference of the Centre's company law department on internal disputes of corporate entities were published in a separate volume. The inaugural lecture of Prof. J.J. Kilborn explored expert recommendations and included an analysis of the multitude of laws establishing (and revising) formal debt adjustment systems in Europe in the period 1984-2010. Prof. L.G. Verburg's inaugural lecture addressed the law relating to the termination of employment contracts. He argued that the applicable regime is outdated and requires modification.

New editions were published of various leading textbooks (e.g. on partnerships and the law of obligations). There was a major overhaul of the textbook on financial supervision, resulting in

a new edition. The Centre reviews leading case law on Business and Law each month.

### Societal impact

The societal impact of research conducted by the Centre is well illustrated by the financial turmoil during the credit crisis. The availability and cost of credit, best practices relating to corporate governance, shareholder activism and financial markets supervision are central to the research of the Centre. Other research topics which directly influence the financial and commercial climate include trusts and protected funds arrangements, secured transactions, the effects of the opening of the insolvency proceedings, combating insolvency fraud, asset management, pension funds, misleading representations in capital market transactions, corporate litigation and the use of flexible corporate entities.

The societal impact is further enhanced by the extensive involvement of its partners in large-scale, permanent research projects. This generates results which are often directly applicable in practice and/or which contain recommendations for legislative and policy reforms to facilitate particular societal needs.

Most senior researchers hold key positions in law reform committees, courts, the Netherlands Authority for the Financial Markets, law firms, banks and/or companies. Researchers are also consulted by the IMF and the World Bank.

### Future research

Pending and future research projects relate to the following topics: the position of private and public shareholders, corporate litigation, alternative dispute resolution, security rights in Europe from a comparative perspective, the treatment of contracts in insolvency, securities and general patrimonial law, rules and best practices relating to coinsurances, the position of pension funds, initial public offerings and corporate criminal law. Permanent research is conducted by the Centre within the framework of several volumes published in the prominent Asser Series.

A major research project was initiated in 2010 in which core topics of insolvency law will be analysed in a comparative perspective in 25 selected countries in and beyond Europe. The results of this project will be published in fifteen volumes, which will provide a main source of reference in international and comparative insolvency law. Other International Working Groups established by the Centre will examine applicable laws and best practices relating to the topics 'Forum Europaeum on Corporate Boards in listed companies' and 'Liability of Asset Managers'. The aim of these projects is to critically analyze domestic legal regimes of selected countries in Europe and to advance recommendations for European harmonization.

The Centre will organize various conferences and seminars in 2011 on a wide range of topics in 'Business and Law'. Furthermore, researchers will participate in the activities of UNCITRAL, INSOL International and INSOL Europe. International expert meetings will be organized by the International Working Groups.

### Research Centre for State and Law (Prof. R.J.N. Schröders)

The Centre for State and Law – *Onderzoekcentrum voor Staat en Recht* (SteR) – focuses on key issues and basic principles in public law. Its researchers critically analyze national, European and international developments in constitutional law, administrative law and criminal law. The Centre is committed to creating a stimulating environment in which high-quality, national and international multidisciplinary research can flourish. SteR includes three research programmes:

- 1 Centre for Migration Law (CMR)
- 2 Administration of Justice
- 3 Principles of Public Law

CMR brings together researchers from various disciplines. Its purpose is to provide a stimulating context for high-quality fundamental and applied research on migration and the protection of minorities. The CMR is unique in Europe for its interdisciplinary approach and the composition of its staff, which includes lawyers, sociologists, anthropologists and political scientists. It is also known for its comparative international approach to research.

The CMR provides a thorough academic training and a stimulating research climate, operating a guest programme that attracts promising PhD students and young postdocs from all over Europe. Research is carried out for international organizations such as the European Community, the Council of Europe, the UNHCR, the International Organization for Migration, the UN Centre for Human Rights, Amnesty International and the European Council on Refugees and Exiles.

Researchers at the CMR also contribute to drafting new European migration law. They organize international conferences and edit the European Journal of Migration and Law, a book series (Immigration Law and Policy in Europe) and a yearbook on Dutch and international migration law (Rechtspraak Vreemdelingenrecht).

Researchers working on Administration of Justice focus on law in action – the working of the courts, public prosecutors and the legal profession. New developments in procedural law are monitored closely against the background of the principles of effective legal protection. In 2010 special attention was paid to the phenomenon of convergence of civil, criminal and administrative procedural law. Common principles and concepts of legal proceedings is also

# Research Centres of the Faculty of Law

## Key publications

### The Business and Law Research Centre

Beekhoven van den Boezem, F.E.J. (2010). *Credit claims: Kredietvorderingen als beleenbare activa voor monetaire beleidstransacties in het Eurosysteem* (2010, december 11). Deventer: Kluwer.

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Dissertations:	7
Scientific publications:	330
Professional publications:	175
Annotations :	182

an important research topic. 'Administration of Justice' involves research in four main areas:

- 1 Legislation and case law relating to procedural law, including the position of citizens in adjudication
- 2 Organizational design and practice of the Administration of Justice
- 3 The quality of Administration of Justice from the point of view of legality, effectiveness and efficiency
- 4 The legitimacy of the Administration of Justice, from the perspective of the ethics of legal professionals

Researchers working on Principles of Public Law focus on the main principles of public law from a national, European and international perspective. They investigate the relationship between principles of the democratic constitutional state (*i.e.* the rule of law, human rights, the democratic order, and accountability) and national and international social developments. The principles are studied with a keen eye on European and global developments. Within the programme, the expertise and know-how of constitutional, administrative, criminal, European and jurisprudential scholars are combined. Research includes exploring the impact of European and International law on fundamental concepts of national law. Due to the Europeanization and internationalization of law these concepts are continuously evolving and transforming.

The research project 'Cosmopolitanism in a world of interconnected threats and challenges: From a world of states to a world state', based on a Vidi grant from the Netherlands Organization for Scientific Research (NWO) for a senior researcher, continued. Several new research projects started in 2010, in particular on the themes of 'law and religion' and 'rules and regulations in public law'.

According to the 2010 research assessment by the National Evaluation Committee for Dutch Law Faculties, SteR performs well. High scores were awarded to the Centre for Migration Law and to the research output of the department of Philosophy of Law, part of the 'Principles of Public Law' programme.

## Awards and acknowledgements

- Prof. P.H.P.H.M.C. van Kempen was appointed Secretary-General of the International Penal and Penitentiary Foundation at the 2010 colloquium of this organization in South Africa
- Prof. Th. Mertens was appointed visiting professor at Leuven University
- NWO awarded a grant for Prof. Th. Mertens' research proposal 'Human Rights and Human Duties: Assessing the Obligations entailed in Human Rights'.

## Collaboration

SteR participates in the International Research Universities Network (IRUN), collaborating with the universities of Münster, Kiel, Leuven, Poitiers, Montpellier, and Exeter. The Centre also has

# Research Centres of the Faculty of Law

international ties with the Max Planck Institute for Foreign and International Criminal Law (Freiburg, Germany), the Challenge project (Challenge Landscape of European Liberty and Security), the International Penal and Penitentiary Foundation, the EU-AGIS programme and the Working Group on Comparative Studies of Legal Profession. Within the Netherlands SteR collaborates with the Council for the Judiciary, the Ministry of Justice, several courts, municipalities and lawyers.

The Centre for Migration Law is responsible for coordinating the European Network on Free Movement of Workers within the European Union, which is funded by the European Commission. The CMR has long-term collaborative arrangements with the Research Centre for Institutional Behaviour and European Integration at the Austrian Academy of Sciences, the European Centre for Social Welfare Policy and Research in Vienna (Austria), the Centre for European Policy Studies (Belgium), the Danish Institute for Human Rights in Copenhagen (Denmark), the Research Centre for International and European Immigration and Asylum Law at the University of Constance (Germany), the Institute of Political Science in Paris (France), the London School of Economics (UK) and the Odysseus Network of Experts in European Migration and Asylum Law.

## Research results

SteR generally disseminates its results through leading publications (including its own book series), and through lectures, conferences and symposia.

CMR researchers finished a research project funded by the European Commission on the content and the impact of compulsory elements in national integration policies (INTEC). CMR researchers prepared the Dutch report for a European Commission project on the Long term Residents Directive. Research on the Association Agreement EC/Turkey was also completed.

In April 2010 an international workshop was organized by the CMR and the Centre for Language Studies on the use of language analysis in Wassenaar. In October 2010 an international conference on the INTEC project was organized in Brussels and in November 2010 the annual conference on Free Movement of Workers was organized in London. Prof. E. Guild was one of the keynote speakers at the Metropolis conference.

Researchers on Administration of Justice carried out two research projects financed by the Council for the Judiciary. One was conducted by Dr A.G.M. Böcker, Dr T. Havinga, Prof. C.J.M. Klaassen and Dr A. Jettinghoff on the Specialization of Judges, the other, on Collegial Courts, by R. Baas MSc, Dr M.T.A.B. Laemers and Prof. L.E. de Groot-van Leeuwen. In February 2010 a conference was organized on 'Convergence of procedural law'.

Within the programme Principles of Public Law, a PhD project on 'Withdrawal of administrative decisions in European and comparative perspective' (Dr A.J. Bok and Prof. R.J.N. Schröders) financed by the NWO started in 2010. Prof. H.J.B. Sackers' inaugural lecture discussed the use of punitive measures, in particular by city mayors, to regulate public order. A research project financed by the National Coordinator for Counterterrorism (NCTb) and the Research and Documentation Centre on Justice (WODC) was carried out by Prof. P.H.P.H.M.C. van Kempen & Ms. J. Van de Voort. The project reviews Dutch antiterrorism legislation in the light of fundamental rights.

## Societal impact

The CMR carried out research on behalf of the UNHCR, the European Commission, the Dutch Ministry of Justice, the Advisory Committee for Aliens' Affairs, the Dutch Refugee Council, FORUM (Institute for Multicultural Development) and the Dutch Foundation for Legal Aid for Asylum Seekers. Consultancy services were also provided to the Council for the Judiciary, the Dutch Refugee Council and FORUM. The Centre's publications have affected both the political and the public debate on a variety of issues. Dr A. Böcker and Prof. A.B. Terlouw are the Dutch experts in the EU-funded Network of Socio-Economic Experts in the Non-Discrimination Field.

Prof. L.E. de Groot-van Leeuwen is a member of the Advisory Editorial Board of Legal Ethics. She chairs the Working Group on the Comparative Studies of the Legal Profession (RCSL).

Prof. Y. Buruma chairs the Admittance Committee Regarding the Evaluation of Completed Criminal Cases. Prof. J.W. van de Gronden is a member of the Committee on International Affairs and of the Commission for Consumer Affairs of the Social-Economic Council (Sociaal-Economische Raad). Prof. C.A.J.M. Kortmann was appointed as a member of the State Committee on the Constitution.

## Future research

The CMR will participate in several projects funded by the EU, including the coordination of the Network on Free Movement of Workers for a period of four years. Research funded by the ERF on new forms on access to asylum procedures and research on monitoring guidelines with regard to traumatized asylum seekers will continue. Research for the Fundamental Rights Agency on access to Justice will start. In 2011 the CMR will organize conferences on the withdrawal of nationality (January 2011); on the Returns Directive (February 2011) and on Polish migrants (April 2011). In 2011 the newly appointed Professor J. Gerards will start a research project on fundamental rights.

## Director: Prof. Steven Bartels

Steven Bartels is Professor of Private Law at Radboud University Nijmegen. Since 1 September 2010 he has been Vice Dean for Research at the Faculty of Law. He is a member of the Board of the Business and Law Research Centre (OO&R) and of the Board of the Law Firm School (an educational institute comprising 14 internationally renowned law firms, which offers professional training programmes certified by the Dutch Bar Association). Prof. Bartels is also a member of the Advisory Board of the prominent Asser Series and of the editorial board of the civil law review *Nederlands Tijdschrift voor Burgerlijk recht*.



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## The Centre for Notarial Law (Prof. F.W.J.M. Schols)

The Centre for Notarial Law – *Centrum voor Notarieel Recht* (CNR) – was established in 2008. Its key research programme addresses notarial law, in particular family property law (personal and family law, relationship between property law, inheritance law and estate planning). The strength of CNR's research lies in the combination of tax and civil law and cross-fertilization between the legal practice and the academic world. Particular attention is paid to the bearing of these fields on the general law of property and to the combination of legal fields, for example marital property law, real-estate law and company law. CNR researchers seek to provide a scientific foundation for notarial practice. Research and academic education are strongly connected. According to the National Evaluation Committee for Dutch Law Faculties, CNR performs well.

### Collaboration

CNR cooperates with ABN Amro Bank NV on estate planning and monitors the academic level of the consultancy services provided by the bank. It also cooperates with the Dutch Foundation for the Professional Education of Notaries (SBN), the Royal Notarial Association (KNB), the Association of Estate Planners in Notarial Practice (EPN), Network Notarial Association and with Tilburg University as part of its course in Notarial and Fiscal law.

### Research results

CNR publishes a series called 'Publicaties vanwege het Centrum voor Notarieel Recht' (currently 9 volumes). In 2010, a volume on 'Partnership' in a broad perspective was published. Prof. B. Schols delivered his inaugural lecture on notarial tax law. 'Delegation of last wills to third parties' and 'The new inheritance tax law' are research projects that started in 2009 and will be continued.

### Societal impact

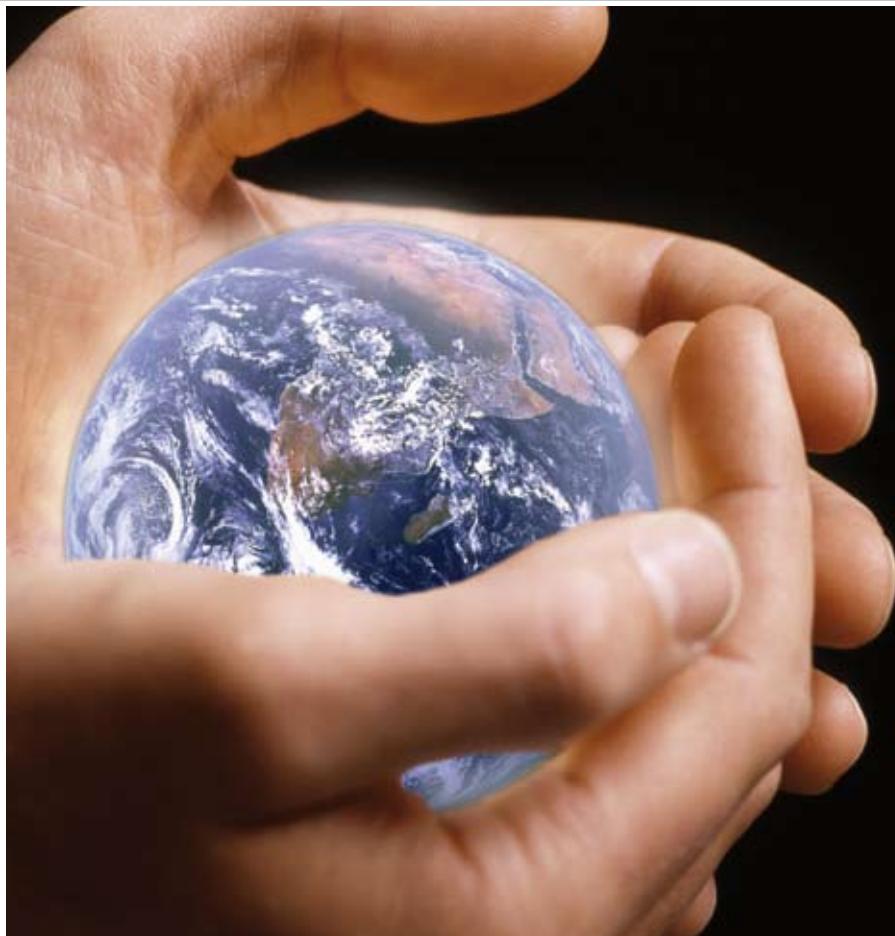
There are strong links between the CNR and legal practice. Researchers are actively involved in lectures, training and legal advice and often comment on current issues in newspapers and on television. Researchers are advisors to the Dutch Government, lecturers (in charge) for the SBN, for the estate planners of EPN, and for the Novex (the Dutch association for executors). They are also involved in the Commission Succession Law II of the KNB and in the Commission Inheritance Tax Law of the KNB, the Board of the Institute for Agricultural Law in Wageningen, the Stichting tot Bevordering der Notariële Wetenschap and the Scientific Council and Board of the Thijmgenoootschap.

### Future research

Continuing projects include the historical development of and the current legal position of the surviving spouse in Dutch civil law, the legal exegesis of the provisions of last wills, international aspects of estate planning, the new law on non-liability partnerships and developments in the legislation on marital property. An empirical study on nuptial agreements will continue in 2011.

# Institute for Management Research

The Institute for Management Research (IMR) is an academic centre of expertise that investigates the structures and performance of public and private organizations. The IMR contributes to understanding and improving the effectiveness, efficiency and legitimacy of the institutional, organizational and management arrangements through which societal systems are organized and governed.



The main research goals are to investigate:

- the fundamental aims, structures and behaviour of the societal system being studied
- the impact of interventions – based on institutional, organizational and management arrangements – on the aims, structures and behaviour of the societal system being studied
- the effectiveness, efficiency and legitimacy of these interventions.

Until January 2011, IMR research carried out by approximately 82 FTE researchers (tenured and non-tenured) took place in the following programmes:

## *Governance and Places (GaP)*

Researchers at GaP study the social and environmental qualities of places, from local to global, with a special focus on issues related to spatial structure and governance. Research topics include urban and regional development, transport and water management, environmental policy, real estate development, identities and borders, and European spatial planning. The programme integrates approaches from human geography, spatial planning, environmental studies and public administration.

## *Nijmegen Centre of Economics (NiCE)*

The focus at NiCE is on researching economic issues from a pluralistic, multidisciplinary perspective. In addition to economic theories, researchers use psychological and sociological theories as well as survey, longitudinal and experimental data sets. There are three themes: experimental and behavioural economy, the influence of culture and institutions on economic markets, and accounting and finance in relation to organizational change.

## *Relational Enterprise (RE)*

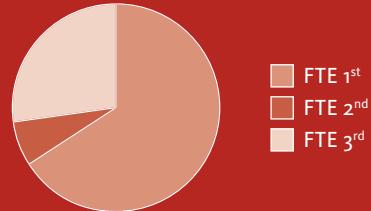
RE is about understanding the way organizations are managed. The research takes an integrated approach, focusing on the relationships and networks formed among members within organizations, as well as with actors and institutions in their fields of expertise. RE researchers study these relationships in four interrelated domains: REalign (e.g. relationship management, partnerships and social networks); REsponsibility (e.g. employability, social responsibility and sustainable development); REthink (e.g. managerial and organizational decision-making processes) and REcreate (e.g. social/product innovation).

## Staff

Prof. J.H.J. Bell (e)	Prof. H.J. Meurs (e)
Prof. M.L. Bemelmans-Videc (o)	Prof. W.F. de Nijs (o)
Prof. Y.W.M. Benschop (o)	Prof. F.D. Pot (e)
Prof. J.M.M. Bloemer (o)	Prof. A.C.R. van Riel (o)
Prof. F.W.M. Boekema (o)	Prof. M.J.R. Schoemaker (e)
Prof. R. ten Bos (o)	Prof. E.-M. Sent (o)
Prof. B. Dankbaar (o)	Prof. J.A.M. Vennix (o)
Prof. A.M.A. van Deemen (p)	Prof. J.A. Verbeek (p)
Prof. J.A.C.M. Doorewaard (o)	Prof. M.M.T. Verloo (p)
Prof. H. Ernst (o)	Prof. D.E.M. Verweij (e)
Prof. H.G. de Gier (p)	Prof. E.G.J. Vosselman (o)
Prof. B.I.J.M. van der Heijden (o)	Prof. M.S. de Vries (o)
Prof. R.E.C.M. van der Heijden (o)	Prof. G.U. Weitzel (o)
Prof. P.H.J. Hendriks (p)	Prof. M.L.J. Wissenburg (o)
Prof. G-J. Hospers (e)	
Prof. E. de Jong (o)	
Prof. G.R.W. de Kam (e)	
Prof. E. van der Krabben (p)	
Prof. H.L. van Kranenburg (o)	
Prof. K. Lauche (o)	
Prof. P. Leroy (o)	
Prof. M.H. Leyenaar (p)	
Prof. R.H. Lieshout (o)	

Tenured		
Full Professors	9.1 FTE	
Associate Professors	9.3 FTE	
Assistant Professors	22.3 FTE	
Researchers	2.5 FTE	
Lecturers	3.0 FTE	

Non-tenured		
Researchers	4.2 FTE	
Doctoral candidates	29.7 FTE	



### Shifts in Government and Governance in a Comparative and International Perspective (SHIFTS)

The focus at SHIFTS is on changes in public governance and management. Despite various forms of pressure on systems of government, such as globalization and privatization a) many of the traditional mechanisms, capabilities and styles of government have not 'shifted' to the extent that the leading theories suggest and b) a trend back to 'old' forms of government is taking place. This programme deals with four interrelated themes: relationships between government and civil society, institutional arrangements for citizen participation in the public domain, shifts in multi-level government and the issue of good governance. Research from different disciplines (public administration and political science) is combined with normative and empirical research approaches.

### Research facilities

The IMR operates the NSM Decision Lab for experimental research based on game theory and social choice theory in order to study co-operative decision making in various empirical domains. Researchers also use the Visa Skills Lab and an Electronic Meeting/Group

Decision Room for studying group processes such as agenda setting and specifying and evaluating policy alternatives. In some cases, IMR researchers actively participate in the construction of special databases, e.g.:

- GaP developed, together with NICIS (the Netherlands Institute for City Innovation Studies) and the PBL (the National Environmental Assessment Agency), a database of the investments in construction and revitalization of Dutch business areas
- NiCE developed a web-based expert system ([www.educof.org](http://www.educof.org)) for policy analysis and diagnosing problems related to educational participation in African countries.
- RE participates in international networks on e.g. human resource management (CRANET), the International Manufacturing Strategy Survey, and the European Manufacturing Survey in order to collect relevant data and conduct comparative analyses.
- The SHIFTS research group on contagious conflict is constructing a data set related to mobilization through a survey (with the Dutch trade union CNV) and simulations in the NSM Decision Lab.

# Institute for Management Research



Dr Krisztina Varró's dissertation (*cum laude*) describes differences in regional development as economies globalize.



## Collaboration

The IMR participates in various Dutch research schools and collaborates with partners in both national and international research networks. New research collaborations include:

- GaP: Dr Martens with the Municipality of Antwerp to develop an innovative parking management model.
- GaP: Prof. De Kam with the University Medical Center Groningen and the HAN University of Applied Sciences on the effectiveness of area-based arrangements for housing and care.
- GaP: Prof. Van der Krabben with Prof. Jacobs (University of Wisconsin) on urban land management strategies and urban regeneration projects.
- NiCE: Dr Delsen with Prof. Pacolet (Katholieke Universiteit Leuven) on globalization and national social security systems.
- NiCE: Dr Heukelom with Duke University, London School of Economics, on the programme 'History of Recent Economics'.
- RE: Dr van Gestel with Dr Nyberg (University of Sydney), Prof Fitzgerald and Dr Hyde (Manchester Business School) on 'The Healthy Worker'.
- RE: Dr van den Brink with scholars from Sloan School of Management to organize a symposium for the Academy of Management in Montreal entitled 'Success Factors and Barriers for Women Leaders: Evidence from North America, Asia and Europe'.
- SHIFTS: Dr Brandsen initiated a 7th European Framework Programme project called WILCO (Welfare Innovations in the Local Context involving 11 European universities).
- SHIFTS: Dr van der Vleuten joined the project 'Governance Export by Regional Organizations' (coordinated by Prof. Börzel of Freie Universität Berlin).

## Research results

Noteworthy published results include:

- GaP: Dr Varró's PhD thesis (*cum laude*) offers a new perspective on the shifting geographies of statehood within Europe under neoliberal globalization. It proposes a new perspective: the 'Politics of Space Approach', which examines on state spatial restructuring processes.
- NiCE: Prof. Weitzel and co-authors observed a weaker market response to stock mergers than to cash mergers, which they identified as 'market correction of misvalued acquirers'.
- NiCE: Prof. Weitzel and fellow researchers analyzed the selfish preferences of the entrepreneurially talented, showing that making a distinction between creative talent and business talent explains systematic differences in the willingness to forego private benefits to avoid losses for others.
- NiCE: Dr Heukelom demonstrated how contemporary behavioural economics scientifically originates in the measurement and decision theories of mathematical psychology.
- NiCE/SHIFTS: Dr Smits, Prof. Verloo and PhD researcher Spierings analyzed data relating to 40,742 women in six Arab countries and found clear evidence that a woman's education is the most important explanatory factor for the kind of employment she gets.
- NiCE: Dr Delsen and Dr Smits found that participation in the Life Course Savings Scheme (Levensloopregeling), introduced in the Netherlands in 2006, is high for females, part-timers and the young. The scheme clearly has the potential to contribute to work-life balance.
- RE: Based on a longitudinal study of welfare state reform in the Netherlands, Dr van Gestel found that organizational changes are not primarily motivated by potential improvements, but

driven by a negative choice, *i.e.* to avoid alternatives that are perceived as worse. This type of reform process leads to ongoing dissatisfaction and continuous change.

- RE/NiCE: Based on a 16-year longitudinal study Dr Poutsma and Dr Braam found that allocating company shares to all employees, when combined with profit sharing, has positive effects on company performance, whereas allocating these benefits to management alone does not produce the desired effects.
- SHIFTS: Dr van Leeuwen found that international actors engaged in peace-building interventions, *e.g.* in Burundi, fail to take into account the weakness of local institutions and thus should adjust their strategies.
- SHIFTS: Dr van der Vleuten and Dr Ribeiro Hoffman identified the conditions under which regional organizations are more or less likely to intervene when democratic principles within one of the EU member states are violated.
- SHIFTS: Dr Mastenbroek and Dr Princen found that the impact of European integration on the structure and culture of national governments remains limited to particular organizations and particular civil servants within central government.

## Awards

IMR researchers received the following prestigious distinctions in 2010:

- Dr van den Brink received the 2010 Emerald Award for Best International Symposium: 'Success Factors and Barriers for Women Leaders: Evidence from North America, Asia and Europe'.
- Dr Heukelom was awarded the Rockefeller Archive Center Grant-in-Aid for research on the Russell Sage Foundation's Behavioral Economics Archives.
- Dr Honingh won the Outstanding Paper Award 2010 of the International Journal of Educational Management for her article '*Teachers' organisational behaviour in public and private funded schools*'.
- Prof. Leroy received the Flemish Rudi Verheyen Prize 2010 for his long career as a social scientist in the field of research and policy advice on environmental issues.
- Prof. Ernst was appointed as a member of the 'Akademie für Raumforschung und Landesplanung' (ARL) in Hannover.
- Dr van Houtum was – in addition to his position at the IMR – appointed as part-time Research Professor Geopolitics at the University of Bergamo in Italy.
- Prof. Sent, for the second consecutive year, won the Frans Duynstee trophy from Radboud University Nijmegen for her frequent comments in the media on the economic crisis.
- Prof. Verbeek received a Senior Fulbright Grant to spend at Syracuse University, USA.
- In addition to her position at the IMR, Prof. Verloo temporarily held the rotating Marie Jahoda Chair at Ruhr Universität Bochum, Germany.
- Prof. De Vries received the 'Recognition for Outstanding Leadership' award from the IASIA (International Association of Schools in Administration).

## Societal impact

Several IMR researchers gave lectures to the general public, wrote articles in newspapers, participated in advisory committees and commented on topical issues on radio and television. Examples include:

- Dr Akkerman organized an international conference at Radboud University Nijmegen on Evidence-based Governmental Policy with the Netherlands' Institute of Government for academic scholars and practitioners.
- Dr Van Gestel gave keynote lectures at several national conferences, such as the Annual conference of the Ministry of Social Affairs and Employment, about Regional networks, the Labour market conference of UWV, and the SCP conference on the inclusion of handicapped people in the labour market.
- Prof. Beate van der Heijden participated as a scientific adviser in a project on 'Ageing workers' (financed by De Stichting Instituut GAK).
- Prof. Beate van der Heijden chaired the Accreditation Committee of the Career Management Institute.
- Dr Helderman was appointed as a member of the Commissie Aedes Code (established to encourage dialogue between social housing organizations and customers).
- Prof. de Jong contributes on a regular basis to *Me Judice*, an independent discussion forum established to encourage debate among economists. On the invitation of the Dutch Ministry of Finance, he gave a presentation on his proposal for a bank tax.
- Prof. Jonker launched the sustainability project 'Our Common Future 2.0, Roadmaps for our Future Society' as a follow-up project in the Netherlands to the Brundtland Report 'Our Common Future'. A conference was organized at Radboud University Nijmegen to discuss the preliminary results of the project.
- Prof. van der Krabben and Dr Martens have been appointed as members of the Provincial Planning Advisory Board (Provinciale Raad voor Omgevingsbeleid Gelderland).
- Dr Mastenbroek gave a Master class on EU implementation for civil servants in training in The Hague.
- Prof. Verloo was invited as an expert at the Meeting on Gender Mainstreaming, EIGE European Institute for Gender Equality Vilnius.
- Dr Wigger organized a series of public debates entitled 'Real World Economics Lectures' at CREA Amsterdam.
- Prof. Wissenburg was Acting President of the Dutch Political Science Association.
- SHIFTS researchers working on industrial conflict organized a meeting with representatives from Dutch and Belgian employers' associations and trade unions.
- Dr Smits is a member of the advisory board of the Indices of Social Development Database of the World Bank at the Institute of Social Studies in The Hague.

# Institute for Management Research

## Key publications

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Delsen, L.W.M. & Smits, J.P.J.M. (2010). Does the Life Course Savings Scheme have the Potential to Improve Work-Life Balance? *British Journal of Industrial Relations*, 48(3), 583-604.

Dühr, S., Colomb, C. & Nadin, V. (2010). *European spatial planning and territorial cooperation*. London, UK: Routledge.

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Dissertations:	15
Scientific publications:	246
Professional publications:	155

## Director: Prof. Rob van der Heijden

In 2001 Rob van der Heijden came to the Nijmegen School of Management as Professor of Spatial Planning from Delft University of Technology, where he had been Professor of Transport Policy and Logistics since 1994. In 2008 he was appointed Vice-Dean of the Faculty alongside his role as Director of the Institute for Management Research. His teaching and research focuses on complex decision making related to spatial infrastructures and urban development. He is currently and has in the past been a member of various scientific and professional advisory boards in this field.



### Institute for Management Research

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## Future research

In 2010 the IMR organized a mid-term evaluation of its research. A self-evaluation report was written, including information on research focus, results and productivity. This provided the basis for recommendations by an external committee of peers, which also held interviews during a site visit early in October 2010. It was concluded that research is developing well in terms of academic status and productivity and that its relevance is high. Good progress has been made in creating an environment for high-level academic research in the future.

The peers supported the intention by the faculty management to re-organize the research portfolio in three new programmes, which are designed to stimulate cross-disciplinary collaboration, while creating an appealing new profile. These programmes are formulated in discussions with researchers at IMR. From January 2011 onwards IMR research will be structured as follows:

- a. Distributional Conflicts in a Globalizing World: Consequences for State-Market-Civil Society Arrangements (Discon)
- b. Responsible Organization (Resorg)
- c. Territorial Governance and Changing Meanings of Places (TerraM).

In 2011 the IMR will invest in six to nine PhD positions for research within these themes. In addition, various initiatives designed to generate external funding have resulted in new PhD and postdoc projects:

- The EU budget for the WILCO project led by Dr Brandsen will be used to fund two PhD positions.
- Dr van Gestel received a grant for two postdoc researchers for a programme called 'Social Security in 2025: individual risks – collective responsibility', funded by the Stichting Instituut GAK, as part of an international research project on the future of Social Security.

- Dr Akkerman received an NWO grant for a postdoc researcher for her NWO-funded project 'Learning from Strikes'.
- Prof. Benschop obtained a grant from STW for a PhD position, focusing on organizational networks, diversity and innovation.
- Prof. Van der Krabben received a grant from the 'Kennis voor Klimaat' Programme for a PhD student to work on the project 'Climate Proof Cities' (with the University of Utrecht).
- Prof. Van Kranenburg and Prof. Jonker started the RESORG PhD School. Twelve candidates were selected to participate during the period from September 2010 to August 2011.
- Dr Lagendijk coordinated a NWO granted proposal for the postdoc project 'Food for thought and thought for food: the local-global entanglement of the slow food movement'
- Dr van Leeuwen and Dr Verkoren received an NWO Grant for the PhD project 'Land Conflicts, Local Governance and Decentralization in Post-Conflict Uganda, Burundi and Southern Sudan'.
- Prof. Leroy and Dr Meijerink received a grant from the national 'Kennis voor Klimaat' programme for a PhD student to work on 'The governance of climate adaption'.
- Dr Martens received a grant from the Cornelis Lely Foundation for a PhD project on 'parking dynamics in urban environments', using an agent-based system.
- Prof. Verloo obtained a grant for a senior researcher from the 'Oranje Fonds' to evaluate 20 two-year projects in the Netherlands, which focus on the participation in society of poorly educated, socially isolated men.
- Prof. Weitzel initiated a joint PhD project in collaboration with the Cognitive Neuroscience Division of the Donders Institute. This is the first research project in an exciting new field called 'neuro-economics', which involves experiments using fMRI scanners.

# Nijmegen Institute for Social & Cultural Research

Researchers at the Nijmegen Institute for Social & Cultural Research (NISCO) use integrated multi-disciplinary and comparative approaches to study societal change and processes of socio-cultural participation and organization in both Western and non-Western societies. A common research framework reflects complementary features in theoretical approaches, data collection, research design and data analysis. Researchers at NISCO focus on three themes: inequality, cohesion, and modernization. To understand the dynamics of societal phenomena and processes, they examine these aspects both from a historical perspective within a single society and in a comparative perspective among different societies. The accredited Research Masters programme in Social Cultural Science provides high-level training in theories and methods for conducting comparative research on societies. NISCO – a research institute of the Faculty of Social Sciences – consists of two research groups: 1) the Research Group Cultural Anthropology and Development Studies and 2) the Research Group Sociology.



## *Inequality*

This theme is about issues related to differences in access to and control over resources that affect peoples' opportunities, such as educational level, labour-market success and differences in lifestyle. Research focuses on the effect of resources on socio-economic achievement and on how variation between and within countries is affected by structural differences and national policies. Ways in which individual, family and group resources affect outcomes such as cultural and political participation and mobility are also studied.

## *Cohesion*

The aim of this research is to describe and explain differences in social participation in formal organizations as well as in informal social networks, including families and other groups. There are three core topics. First, developments in the relationships between social participation and both pro-social and antisocial behaviour are explored, focusing on variations among societies with different welfare-state regimes. Second, a comparative examination is made of the extent to which social groups display exclusionist attitudes

and behaviour towards particular out-groups, keeping in mind the effect of economic, cultural and demographic contexts. Third, the production, reception and interpretation of these representations of social reality are studied in relation to social participation and exclusionism in societies whose democratic systems differ in terms of stability and longevity.

## *Modernization*

Researchers at NISCO compare secularization and socialization in Dutch and European societies to modernization processes taking place in other societies. A great deal of attention is paid to belief systems and meaning derived from religion, justice and altruism and the implications for societal participation. NISCO research also includes a focus on modernization processes in developing countries and their effects on inequality and poverty as well as social and political cohesion, while integrating aspects such as gender differences and ethnic identities. In that respect, the responses of governments to differentiated aspects of processes of modernization at different levels (e.g. civil society organisations and individual citizens) are also researched and assessed.



## Staff

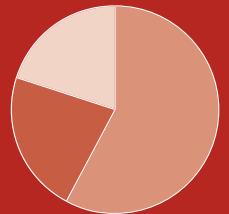
Prof. R.N. Eisinga (o)  
Prof. P.R.J. Hoebink (e)  
Prof. F.A.M. Hüskens (o)  
Prof. W.H.M. Jansen (o)  
Prof. G.L.M. Kraaykamp (o)  
Prof. R. Ruben (o)  
Prof. P.L.H. Scheepers (o)  
Prof. W.C. Ultée (o)  
Prof. T. Widlok (o)

### Tenured

Full Professors	2.5 FTE
Associate Professors	2.2 FTE
Assistant Professors	4.9 FTE

### Non-tenured

Researchers	5.9 FTE
Doctoral candidates	13.1 FTE



■ FTE 1<sup>st</sup>  
■ FTE 2<sup>nd</sup>  
■ FTE 3<sup>rd</sup>

## Awards and grants

The Research Group Sociology received several awards and grants in 2010. Drs. M. de Lange received a Frye Stipendium and an Erasmus Staff Training Grant; Drs. M. Savelkoul received a European Science Foundation Grant. Drs. Notten received a Life Long Learning Grant. Dr Nienke Moor received the J.C. Ruigrok Prijs 2010 for Social Research from the Royal Netherlands Academy of Arts and Sciences (KNAW) for her dissertation on religious diversity. New research grants were received from the National Research Foundation's (NWO) programme for studies of social change and education, as well as from the Scientific Research and Documentation Centre of the Ministry of Justice.

The former subgroup Development Studies received a grant from the NWO for expanding a database on private aid. Smaller new subsidies for research were received from several private aid agencies in the Netherlands for a study on private initiatives by Dutch citizens to support small projects in developing countries and from Cordaid for a study on migration from the Great Lakes region in Africa.

## Research facilities

Researchers at NISCO specialize in analyzing and making available data collections. These include both longitudinal collections – on individuals and their life courses and networks within specific social contexts (in the Netherlands and several other countries) – and cross-national collections that focus on a wide range of countries. These data are considered pertinent for comparative research at this Institute, providing useful opportunities for multidisciplinary cooperation. A new edition of the Dutch Family Survey, which was started in 2009, was completed in 2010 and the Dutch database on non-governmental development cooperation was launched (see: [www.ngo-database.nl](http://www.ngo-database.nl)).

## Collaboration

NISCO collaborates closely with:

- Australian National University (Canberra) and the Cairns Institute (James-Cook-University, Australia)
- The Universities of Antwerp, Ghent and Leuven (Belgium)
- The University of Aarhus (Denmark)

# Nijmegen Institute for Social & Cultural Research



Dr Nienke Moor received the 2010 J.C. Ruigrok Prize from the Royal Holland Society of Sciences and Humanities for her dissertation *Explaining worldwide religious diversity*. She concluded that if – due to technological developments – societal structures change, religious concepts will also evolve.

- The Centre National de Recherche Scientifique and SciencePo Paris (France)
- The Max-Planck-Institut für Ethnologische Forschung in Halle, Westfälische Wilhelms-Universität in Münster and the Universities of Berlin, Bamberg, Frankfurt, Heidelberg and Bayreuth (Germany)
- Harvard University, Northwestern University, Evanston (Illinois) and John Hopkins University (USA)
- The Centre for Comparative Social Surveys in London and the Universities of Oxford and Sussex (United Kingdom).

There is also extensive research collaboration with:

- Universidad Católica Cardenal Raúl Silva Henríquez (Chile)
- Universitas Gadjah Mada Yogyakarta (Indonesia)
- Muhimbili University of Health and Allied Sciences (Tanzania)
- Khon Kaen University (Thailand)
- Martyrs University (Uganda).

International partnerships have been established through the South Africa-Netherlands Research Programme on Alternatives in Development (SANPAD), the MICAD project with Bethlehem University and Edulink programmes with East African universities. NISCO staff also participate in international research networks, such as EQUALSOC (European network for research expertise on economic change, quality of life and social cohesion), European Consortium for Sociological Research (ECSR), the European Association of Social Anthropologists (EASA), the European Society for Oceanists (ESfO), the European Research Centre on Migration and Ethnic Relations (ERCOMER), the Research Network on European Port Cities, ERANET Learning in Knowledge Society, the Network of Excellence 'Enhancing the Interest in Science in a Developing Europe' (EISDE), the International Communication Organization

(ICA), the International Association of Mass Communication Research (IAMCR), the Development Policy Review Network and the International Civil Society Forum on Conflicts (INFOCON).

NISCO researchers also participate in several national and international organizations such as the International Sociological Association (ISA), Dutch Sociological Association (NSV), Dutch Anthropological Association (NVA), European Association for Development Institutes (EADI), International Initiative for Impact Evaluation (3ie), Interuniversity Group on Social Stratification and Life Course Research (ISOL), the Association for Social Anthropology in Oceania (ASAO), the Caribbean Studies Association (CSA), the European Association for South-East Asian Studies (Euroseas), and the European Society for Ecological Economics (ESEE).

Members of NISCO cooperate with counterparts in other Dutch research schools, including the Research School for Resource Studies for Development (CERES) and the Interuniversity Centre for Social Science Theory and Methodology (ICS).

## Research results

**Cultural Anthropology and Development Studies Research Group**  
Research by the former subgroup Development Studies on Institutions in Development analyzes the strategies of national and international networks that contribute to poverty alleviation, empowerment and democratisation and in particular their reactions to modernization. An earlier dissertation showed that back donors and the search for externalities are major causes for the geographical concentration of activities of private aid agencies. This has now been confirmed in other studies that analyze the Dutch system

of aid allocation to civil society organizations, options for programmatic cooperation between Northern and Southern Non-Governmental Organisations (NGOs), and the effectiveness of different types of development assistance and the way donor agencies and aid recipients work together under the so-called New Aid Architecture. The database on Dutch NGOs is used to analyse the role of funding structures in allocating aid. Attention is also paid to progress in mainstreaming gender in development programmes. Impact studies conducted in India, Peru, and Ghana reveal that outreach of primary health care, education, and sanitary service programmes goes far beyond the intended beneficiaries. New studies on reproductive health programmes in Tanzania are exploring whether outreach is different for public, private, and voluntary agencies and revealing *inequalities in wealth*.

Research conducted by the former subgroup Social and Cultural Anthropology focuses on the power of culture and the culture of power by ethnographically studying local issues and by comparatively relating them to processes of modernization and global change. Studies focus on identity formation in the Caribbean, the role of religion in Mediterranean cities, Maori intellectual property rights and the formation of ethnic boundaries, and the relevance of rituals in social life. New research has started on collective violence as a form of social action that is playing a role in communal identities in Indonesia and the Philippines and affecting social cohesion. The project uses multi-sited ethnography of security groups, integrating theories and specific insights from anthropology, sociology and religious studies. Members of the research group have been engaged with interdisciplinary research on the role of ritual in conflict and conflict-resolution and have worked comparatively on cultural tourism and its social implications.

#### *Sociology Research Group*

Research within the Sociology group on a cross-national comparison of *social cohesion* has shown that a lack of labour market success and partner resources explains why poorly educated people are likely to be economically vulnerable. In a second project, using logistic multi-level models, analysis of data on individuals from 29 European countries and Israel demonstrated that individual ideology and political regime are independently associated with self-rated health. However, individual political ideology was more strongly associated with self-rated health than political regime.

Life-course research on the Family Surveys of the Dutch Population involving the intergenerational transmission of cultural resources has identified three forms in which cultural capital manifests itself: the institutionalized state, the embodied state and the objectified state. Respondents' schooling levels (institutionalized state) are particularly affected by parental education and, to a lesser extent, by parental cultural behaviours. In individuals cultural participation (embodied state) is affected by all three manifestations of parental cultural capital, although the embodied state is by far the most

#### **Institute for Gender Studies (IGS)**

**Prof. Willy Jansen**

[www.ru.nl/genderstudies](http://www.ru.nl/genderstudies)

The interdisciplinary Institute for Gender Studies (IGS) works at the crossroads of the social sciences, arts, religious studies, philosophy, medical sciences, law and management sciences. With four professors, two associate professors, five university lecturers, and seven junior researchers, IGS is the largest gender studies institute in the Netherlands.

Mission of the research programme *The Dynamics of Gender, Body, Culture and Policies* is to contribute to the scholarly understanding of changes in gender, gender relations and sexuality, and to make the results available to society. The research starts from the premise that gender continually shows itself to be a crucial factor in the structuring of society and culture, that gender closely intersects with other divisions in society, and impacts greatly on people's lives. The research focuses on the dynamics of gender by studying individual and collective agents of change and the social, political and cultural constellations under which such changes occur.

important. Possessing art objects (objectified state) is mostly affected by parental cultural goods.

Research on modernization processes using Eurobarometer data has shown that people in the Netherlands became systematically more sceptical towards the EU, whereas the opposite was found in Spain. The introduction of the euro partially explains these divergent trends, but the direction of this effect varies with a country's GDP. Changes in the degree of attention that the media pays to the EU further explain the changes in the public's attitude.

Little research has been carried out on long-term trends in social stratification in the Netherlands. The application of multinomial logit regressions on cohorts entering education between 1946 and 1998 reveals that the choice of a secondary track strongly depends on parental education and the occupational status of the father. A downward linear trend for the effect of fathers' occupation (in the intermediate tracks) on cohorts who entered secondary education between World War II and the 1990s was found. The effects of parental education also decreased after World War II, but this trend was curvilinear and thus not enduring.

The Communication Science research group moved to the Behavioural Science Institute (BSI) in 2010, opening up new and fruitful scientific perspectives for cooperation between NISCO and BSI.

# Nijmegen Institute for Social & Cultural Research

## Key publications

Altena, M.M.A., Notermans, C.D. & Widlok, T. (2011). Place, Action, and Community in Internet Rituals. In R.L. Grimes, H.J.M. Venbrux & U. Simon (Eds.), *Ritual, Media, and Conflict* (pp. 133-163). Oxford: Oxford University Press.

Davids, T. & Eerdewijk, A.H.J.M. van (2011). On track with gender: Revitalizing the agenda for gender mainstreaming. In P.R.J. Hoebink (Ed.), *The Netherlands Yearbook on International Cooperation 2009-2010* (pp. 103-118). Assen: Van Gorcum.

Driessen, H.G.G.M. (2010). Borders Besieged: A View on Migration from the European-African Edge. In D. Bechev & K. Nicolaidis (Eds.), *Mediterranean Frontiers. Borders, Conflict and Memory in a Transnational World* (pp. 167-177). London: IB Taurus (Library of International Relations, 46).

Gesthuizen, M.J.W. & Scheepers, P.L.H. (2010). Economic Vulnerability among Low-Educated Europeans Resource, Composition, Labour Market and Welfare State Influences. *Acta Sociologica*, 53(3), 247-267.

Hoebink, P.R.J. (Ed.). (2011). *European Development Cooperation: In Between the Local and the Global*. Amsterdam: Amsterdam University Press.

Hoop, T.J. de & Kempen, L.A.C.M. van (2010). Trust in health providers as a catalyst for malaria prevention: Heterogeneous impacts of health education in rural Ghana. *Developing Economies*, 48(3), 376-404.

Huijts, T.H.M., Monden, C.W.S. & Kraaykamp, G.L.M. (2010). Education, Educational Heterogamy, and Self-Assessed Health in Europe: A Multilevel Study of Spousal Effects in 29 European Countries. *European Sociological Review*, 26(3), 261-276.

Huijts, T.H.M., Perkins, J.M. & Subramanian, S.V. (2010). Political regimes, political ideology, and self-rated health in Europe: A multilevel analysis. *PLoS One*, 5(7), e17111.

Knippenberg, L.W.J. & Jong, E.B.P. de (2010). Moralising the Market by Moralising the Firm Towards a Firm-Oriented Perspective of Corporate Social Responsibility. *Journal of Business Ethics*, 96(1), 17-31.

Kraaykamp, G.L.M. & Eijck, C.J.M. van (2010). The Intergenerational Reproduction of Cultural Capital A Threefold Perspective. *Social Forces*, 89(1), 209-231.

Lubbers, M. & Scheepers, P.L.H. (2010). Divergent trends of euroscepticism in countries and regions of the European Union. *European Journal of Political Research*, 49(6), 787-817.

Meijl, A.H.M. van (2010). Anthropological Perspectives on Identity: From Sameness to Difference. In M. Wetherell & C.T. Mohanty (Eds.), *The Sage Handbook of Identities* (pp. 63-81). Los Angeles, CA: SAGE.

Ruben, R. & Zuniga Arias, G.E. (2011). How Standards Compete: Comparative impact of coffee certification schemes in Northern Nicaragua. *Supply Chain Management*, 16(2).

Tieben, N. & Wolbers, M.H.J. (2010). Success and failure in secondary education: Socio-economic background effects on secondary school outcome in the Netherlands, 1927-1998. *British Journal of Sociology of Education*, 31(3), 277-299.

Widlok, T. (2010). Bringing Ethnography Home? Costs and Benefits of Methodological Traffic across Disciplines. In M. Melhuus, J.P. Mitchell & H. Wulff (Eds.), *Ethnographic Practice in the Present* (pp. 42-55). New York: Berghahn Books (EASA series, 11).

Dissertations:	3
Scientific publications:	108
Professional publications:	46

## Societal impact

Members of NISCO regularly advise a wide range of public and private institutes and have advisory positions in a variety of domains. This work includes supporting international data collections (European Social Survey, European Value Survey), national data collections (CBS, DANS, NELLS, Rekenkamer, WODC, ZonMW and CBF) and data on funding by public and private organizations engaged in development cooperation (DGIS/Ministry of Foreign Affairs, Cordaid, ICCO, Plan Nederland, PSO, Hivos, Oxfam-Novib and others).

NISCO fellows are editors of *Focaal*, *Ecological Economics*, the *Netherlands Yearbook on International Cooperation*, and the *International Spectator*; guest editors for the *Third World Quarterly* and *International Journal of Cultural Property*, and members of the editorial boards of the *Journal on Chain and Network Science*, *Bulletin of New Zealand Studies*, *Oceania Newsletter* and *Open Anthropology Journal*.

NISCO researchers participated widely in public debates and media presentations on topics such as the role of ethnic diversity

## Director: Prof. Paul Hoebink

Paul Hoebink, who has been Extraordinary Professor of Development Cooperation at Radboud University Nijmegen since 2008, succeeded Prof. Ruben as director of NISCO in September 2010. Prof. Hoebink's research focuses on European and Dutch foreign development cooperation and its effects on poverty reduction. He has advised Ministers of Development Cooperation, the Ministry of Foreign Affairs, the European Commission, and several private aid organisations on development cooperation issues.



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and social capital in European societies. Prof. Hoebink wrote a detailed report for the Scientific Council for Government Policy (WRR) on changes in the institutional landscape in Dutch development cooperation over the years, which was published by the WRR on the web, providing important background material for a report by the WRR on Dutch development cooperation. Sociology researchers Dr Tolsma and Dr Wolbers investigated the social consequences of educational expansion on behalf of the Raad voor Maatschappelijke Ontwikkeling (Council for the). Their report stimulated extensive media attention, as did a report on Sharia law in the Netherlands by anthropology researcher Dr Bakker for the Ministry of Justice.

### Future research

The research programmes of the Cultural Anthropology and Development Studies Research Group (central themes *equality, cohesion and modernization*) will continue to focus on topics such as:

- the impact of private aid programmes on poverty, inequality and cohesion
- the role mobility plays in the construction of social communities and the emergence of new inequalities and conflict
- the links between productive health and differences in wealth
- the interfaces between cooperatives and value chains and the impact on inequalities in the agricultural sector
- the New Aid Architecture and its effects on poverty and inequality in aid recipient countries.

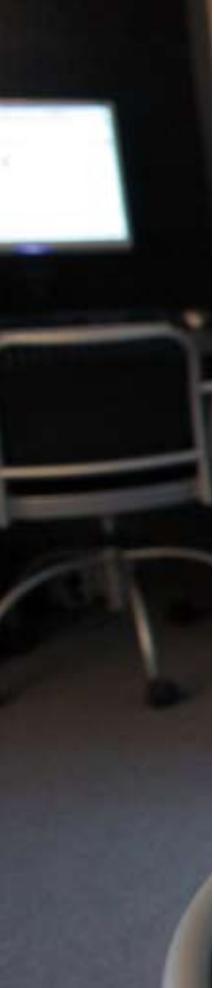
These programmes are funded by the Ministry of Foreign Affairs, Cordaid and other private aid agencies, such as NWO/WOTRO. They will lead to a series of PhD theses, which will be defended in 2011 and 2012.

In the Sociology Research Group the focus is on the key themes *inequality, cohesion and modernization*, with publications containing life-course analyses and multi-level modelling on topics such as:

- social capital and health
- abortion rules and abortion practices
- cultural capital in schooling
- composition of neighbourhoods and their effects
- attitudes on children's socialisation
- labour market vulnerabilities
- and inter-ethnic prejudice and contacts.

In particular, cross-national research in the research programmes is being extended. Results from the recently concluded Dutch Family Survey will be processed and analyzed. The NWO programme on the correlates of ethnic diversity in local communities in Europe will be carried out by two postdocs and the programme on ethno-religious conflicts in South-east Asia will be carried out by four PhD students. Funding is also anticipated for the five-yearly survey 'Social and Cultural Developments in the Netherlands'.

# Centre for Language Studies



The mission of the Centre for Language Studies (CLS) is to carry out top-level research in Linguistics, Language & Speech Technology, and Communication Studies in a stimulating academic environment. Key aspects are innovation, an interdisciplinary approach and a strong commitment to acquiring research funds, which helps strengthen the profile of research done at the Centre both in the Netherlands and abroad.



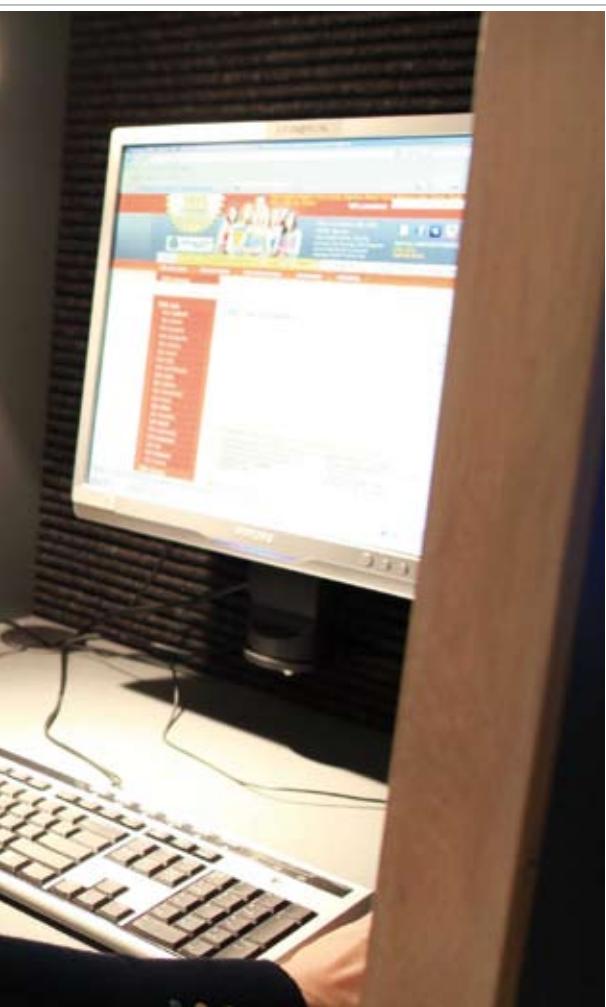
There are five research programmes:

- Grammar and Cognition, combining theoretical research on language as a cognitive function with psycholinguistic research on language processing and language acquisition.
- Language in Time and Space, focusing on the comparative study of patterns of language contact, diffusion and change in a variety of different language settings and historical time-depths.
- Linguistic Information Processing, dealing with the development of computational models of language acquisition and processing, and testing these models under laboratory and real-world conditions.
- Communicative Competences, focusing on how human beings acquire and maintain an ability to communicate successfully in a variety of contexts and modalities, as well as under various constraints.
- Professional Communication, which involves identifying and explaining the cultural and linguistic factors that influence the effectiveness of documents.

Prof. Stephen Levinson of the Max Planck Institute for Psycholinguistics and Radboud University Nijmegen has been awarded a prestigious ERC Advanced Grant. The purpose of this five-year project is to carry out an interdisciplinary study of human communicative interaction. The research will be guided by the hypothesis that human interactive abilities are distinct from – and phylogenetically older than – our language capacity. The hypothesis suggests that the interaction system is fundamentally ethological and universal, while the language system lacks many universal characteristics and is largely diversified by cultural evolution.

Daphne Theijssen received a Fulbright Grant to do part of her PhD research at Stanford University in California.

Dr Helmer Strik was awarded three grants for work designed to include language and speech technology in end-user products for patients with speech and language disorders and for second language learners.



## Staff

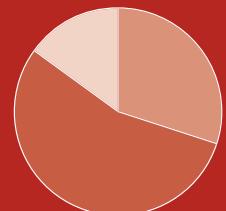
Prof. L.W.J. Boves (o)  
 Prof. P.A.J.M. Coppen (p)  
 Prof. A.F.J. Dijkstra (p)  
 Prof. N.J. Enfield (e)  
 Prof. J.P.M. Fikkert (p)  
 Prof. M. Gerritsen (p)  
 Prof. C. Gussenhoven (p)  
 Prof. H. Hoeken (o)  
 Prof. H. de Hoop (p)  
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 Prof. H.M.G.M. Jacobs (o)  
 Prof. C.J.M. Jansen (o)  
 Prof. A.M.C. van Kemenade (o)  
 Prof. W. Klein (e)  
 Prof. H.P.M. Knapen (e)  
 Prof. S. Kroon (e)  
 Prof. D.A. van Leeuwen (e)  
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 Prof. M.J.P. van Mulken (o)  
 Prof. P.C. Muysken (o)  
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 Prof. A. Özyürek (p)  
 Prof. T. Rietveld (p)  
 Prof. R.A. van der Sandt (e)  
 Prof. P.J. Schellens (o)  
 Prof. L.G. de Stadler (e)

### Tenured

Full Professors	7.4 FTE
Associate Professors	3.9 FTE
Assistant Professors	5.1 FTE
Researchers	2.0 FTE

### Non-tenured

Researchers	16.7 FTE
Doctoral candidates	39.1 FTE



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

Dr Suzan Verberne, Prof. Lou Boves and Prof. Kees Koster obtained a Google Digital Humanities Grant for disclosing digitized Dutch texts using a fact-based search system.

In 2010 twelve dissertations were defended, including one cum laude: Sander Lestrade's 'The Space of Case'.

### Research facilities

CLS research is becoming more and more empirical and experimental. As a result, facilities such as experimental laboratories, experimental equipment, powerful computers and sophisticated software, as well as enriched written, spoken, and multimodal sign language databases play an increasingly important role.

### Collaboration

- Long-standing collaboration with a number of groups at the Max Planck Institute for Psycholinguistics and the Donders Institute for Brain, Cognition and Behaviour.

- Collaboration with the Meertens Institute on the Netherlands Organisation for Scientific Research (NWO)-funded research projects 'Intonation in varieties of Dutch' (also involving Leiden University), the 'Dutch Bilingualism Database' (also involving the University of Tilburg), and 'Roots of Ethnolects'.
- The Typological Database System (also involving Utrecht University), the Surinam Creole Archive and the Dutch Sign Language Database were completed, together with the University of Amsterdam.
- Collaboration with the Sint Maartenskliniek and the OSTT Development Centre for Speech and Language Technology in Nijmegen on a Communication Assessment project.
- Collaboration in the Marie Curie International Training Networks SCALE (<http://www.scale.uni-saarland.de/cms/>) and Bayesian Biometrics for Forensics (BBforz) programmes, with IDIAP Research Institute Martigny (Switzerland), RWTH Aachen (Germany), Saarland University (Germany), University of Edinburgh (UK), University of Sheffield (UK), Toshiba (UK),

# Centre for Language Studies

Dr Helmer Strik (Assistant Professor), who is involved in speech technology research, develops user interfaces designed to assist patients with language or speech disorders (as well as people who are learning a second language). See picture p. 46-47.



Philips Speech Recognition Systems/Nuance, Forensic Sciences Services (UK), TNO (NL) and Agnitio Voice Biometrics (Spain).

- The EURYI project (Dr Miriam Ernestus) involves collaboration with the Max Planck Institute for Psycholinguistics, the University of Glasgow (Rachel Smith), LIMSI, Paris (Martine Adda Decker), Université Paris 3 (Cecile Fougeron), University of Alberta (Harald Baayen), Northwestern University, Illinois (Janet Pierrehumbert), the University of Arizona (Natasha Warner), the University of Manitoba (Kevin Russell), and the Hogeschool voor Wetenschap & Kunst (University College for Sciences and Arts) in Brussels.
- Collaboration with the University of Limpopo (South Africa), the University of Tilburg (the Netherlands) and University of Stellenbosch (South Africa) on the HACALARA project in the context of HIV/AIDS intervention programmes.

## Research results

The ERC project coordinated by Prof. Pieter Muysken TRACES OF CONTACTS, which is designed to establish criteria by which the results of language contact studies can be used to strengthen the field of historical linguistics, has produced useful output. A typological database for South American languages is being created, including approx. 320 detailed questions on Tense/Mood/Aspect/Evidentiality, Noun Phrase Structure, Argument Realization and Subordination, and the resulting data will be coded for some 70 languages. In addition, an online storage site has been established for instruments and materials for data elicitation in fieldwork; this includes non-verbal stimulus materials such as video clips, drawings, photographs, as well as story-based and list-oriented questionnaires (website of the project: <http://www.ru.nl/linc/>). This material is being tested with speakers in Surinam, Chile,

Morocco, Hong Kong, Aruba, Turkey, Indonesia, India, and the Netherlands to see whether speakers who have emigrated to Surinam and the Netherlands have adapted their native languages to the dominant language in the country of arrival: Sranan and Dutch, respectively.

Within the ERC project coordinated by Dr Onno Crasborn ON THE OTHER HAND, which investigates the effects of the physical differences between spoken and signed languages on the structures of both types of languages, the first data collections and the enrichment of the NGT Corpus have been finished. Documents describing the annotation standards will be shared online in the spring of 2011. In the SignSpeak project, a basic lexicon has been developed for NGT – improving glossing consistency – and published. This lexicon will also be available in the MPI's LEXUS tool from the spring of 2011. Within the SignLinC project, a link has been created between such a lexicon and the annotation tool.

The ERC project coordinated by Prof. Asli Özyürek LANGUAGE IN OUR HANDS starts from the assumption that gesture and speech form an integrated system during language production. Within this project it is investigated whether the two modalities mutually interact in comprehension as well. In one experiment the participants were presented with action primes (e.g. someone chopping vegetables) as well as bimodal speech and gesture targets. Participants related primes to targets more quickly and accurately when they contained congruent information (e.g. speech: "chop"; gesture: chop) than when they contained incongruent information (e.g. speech: "chop"; gesture: twist). Moreover, the strength of the incongruence affected processing, with fewer errors for weak incongruities (speech: "chop"; gesture: cut) than for strong

incongruities (speech: “chop”; gesture: twist), suggesting that comprehenders take the semantic relationships between the two modalities into account when processing either modality.

The group led by Dr Mirjam Ernestus continued its research on the reduced pronunciation variants that characterize casual speech. This research demonstrated that the degree of reduction depends on a number of very different factors. One is the relative frequency of the morphological forms of a word: the most frequent form tends to be reduced most often, even if that form consists of multiple morphemes. Thus, frequency seems more important than complexity, probably because frequent forms are retrieved as complete units in the mental lexicon. Another factor is the function of the word in the discourse. Dutch words such as *eigenlijk* and *natuurlijk* tend to be more reduced when used to set the scene at the beginning of a conversation (*Je weet natuurlijk dat hij getrouwde is....*) than in response to a question. Moreover, reduction patterns differ between languages: French reduces vowels, Spanish consonants.

PhD candidate Jort Gemmeke, who investigated noise-robust automatic speech recognition, was able to extend the CLS’ Sparse Coding approach to large vocabulary tasks. This outperforms most competing approaches, especially for very low signal-to-noise ratios.

Prof. Paula Fikkert and her PhD candidate Nicole Altwater finished their investigations on Manner of Articulation, in particular with respect to plosive-fricative contrasts. In a series of experiments using different experimental procedures and different age groups, they showed that, while children are able to discriminate a stop-fricative contrast bidirectionally, comprehension is asymmetric: children clearly notice mispronunciation of a word such as *vis* (‘fish’), when it is produced as *bis*, but do not notice a mispronunciation from stop to fricative: they seem to regard *voom* as a good enough representation of the word *boom* (‘tree’).

In 2010, the NWO project on animacy coordinated by Prof. Helen de Hoop was completed. It was concluded that animacy plays an important role in language, yet always in interaction with other factors such as definiteness, word order and case. The various factors are not independent and clearly influence each other. Animacy in processing can only be explained if other factors such as the type of the verb (and its selectional restrictions) and case are also taken into account. Several corpus studies on word order in Dutch revealed that animacy plays a quite striking role in predicting the relative position of constituents, but only when other factors such as definiteness and constituent length are cancelled out. This interdependence of animacy with other factors is a cross-linguistic phenomenon.

PhD candidate Sander Lestrade finished his dissertation, in which a functionally motivated account of the use of morphological case is presented. In his dissertation, he combined insights from syntax,

semantics, pragmatics, typology and corpus research. The use of case is argued to follow from economy as well as the generalization principles that are necessary for efficient communication. Special attention is given to the spatial use of case that expresses the most frequent spatial meaning aspect: the change of relative position.

The researchers in the NWO programme ‘Syntax and Information Structure: discourse options after the loss of V2’, Prof. Ans van Kemenade and Dr Bettelou Los, succeeded in speeding up the annotation of their database for coreference by developing a semi-automatic coreferencing tool. Pilot studies have confirmed that the current system of coreference annotation allows searches that combine syntax with information structure.

Dr Odette Scharenborg’s Veni project AVOIDING THE HAM IN HAMSTER was successfully completed, resulting in a software package, called Fine-Tracker, which is now available free of charge for those conducting experiments in computer simulations of spoken word recognition.

Research on professional communication in foreign languages carried out by Prof. Marinel Gerritsen, Prof. Margot van Mulken, and Dr Marianne Starren has shown that non-native users of English are capable of disregarding or compensating for the underlying preferred information structure of their mother tongue and that access to the lexicon is influenced by both the second and the native language of a bilingual individual. If non-native speakers disregard socio-pragmatic conventions, however, this will have a negative impact on attitudinal measures.

### Societal impact

Prof. Roeland van Hout was involved in societal organizations working on dialect and regional languages and in discussions about the recognition of regional languages as well as those on the topic of dialect and education.

The findings in Prof. De Hoop’s Animacy project on the use of the pronoun *hun* as a subject led to a heated debate about “correct” and “incorrect” language use. This discussion extended far beyond the borders of academia after a letter by the Minister of Education was printed in a national newspaper in which he declared that he would never allow this construction to become part of Dutch grammar. Subsequently, Prof. Helen De Hoop and the Minister were invited to one of the most popular television shows in the Netherlands to discuss the phenomenon of *hun* as a subject in Dutch, to which a clear social stigma is attached. The impact of this performance was clear from the many reactions on internet forums, in newspapers and other media afterwards.

In South Africa, health communication designed to influence people’s HIV/AIDS-related behaviour relies heavily on the use of verbal and visual rhetoric. The risks as well as the opportunities

# Centre for Language Studies

## Key publications

Altvater-Mackensen, N. & Fikkert, J.P.M. (2010). The acquisition of the stop-fricative contrast in perception and production. *Lingua*, 120, 1898-1909.

Bürki, A., Ernestus, M.T.C. & Frauenfelder, U.H. (2010). Is there only one “fenêtre” in the production lexicon? On-line evidence on the nature of phonological representations of pronunciation variants for French schwa words. *Journal of Memory and Language*, 62, 421-437.

Craats, I. van de & Hout, R.W.N.M. van (2010). Dummy auxiliaries in the second language acquisition of Moroccan learners of Dutch: form and Function. *Second Language Research*, 26(4), 473-500.

Fournier, R.A., Gussenhoven, C., Jensen, O. & Hagoort, P. (2010). Lateralization of tonal and intonational pitch processing. *Brain Research*, 1328, 79-88.

Gemmeke, J.F., Hamme, H. Van, Cranen, B. & Boves, L.W.J. (2010). Compressive Sensing for Missing Data Imputation in Noise Robust Speech Recognition. *IEEE Journal of Selected Topics in Signal Processing*, 4(2), 272-287.

Gerritsen, M., Nickerson, C., Hooft, A.P.J.V. van, Meurs, F. van, Korzilius, H.P.L.M., Nederstigt, U., Starren, M.B.P. & Crijns, R.M.J. (2010). English in Product Advertisements in Non-English-Speaking Countries in Western Europe: Product Image and Comprehension of the Text. *Journal of Global Marketing*, 23(4), 349-365.

Gijn, R. van (2010). Middle voice and ideophones, a diachronic connection: the case of Yurakaré. *Studies in Language*, 34(2), 273-297.

Grondelaers, S.A. & Hout, R.W.N.M. van (2010). Is Standard Dutch with a regional accent standard or not? Evidence from native speakers' attitudes. *Language Variation and Change*, 22, 221-239.

Hammarström, H. (2010). A full-scale test of the language farming dispersal hypothesis. *Diachronica*, XXVII(2), 197-213.

Kankaanranta, A. & Planken, B.C. (2010). BELF competence as business knowledge of internationally operating business professionals. *Journal of Business Communication*, 47(4), 380-407.

Kelly, S.D., Özyürek, A. & Maris, E. (2010). Two sides of the same coin: Speech and gesture mutually interact to enhance comprehension. *Psychological Science*, 21(2), 260-267.

Lestrade, S.A.M. (2010). Finnish case alternating adpositions: A corpus study. *Linguistics*, 48(3), 603-628.

Mulken, M.J.P. van, Pair, R.G. le & Forceville, Ch. (2010). The impact of perceived complexity, deviation and comprehension on the appreciation of visual metaphor in advertising across three European countries. *Journal of Pragmatics*, 42(12), 3418-3430.

Slik, F.W.P. van der (2010). Acquisition of Dutch as a Second Language: The Explanative Power of Cognate and Genetic Linguistic Distance Measures for 11 West-European First Languages. *Studies in Second Language Acquisition*, 32(3), 401-432.

Verberne, S., Boves, L.W.J., Oostdijk, N.H.J. & Coppens, P.A.J.M. (2010). What is not in the Bag of Words for Why-QA? *Computational Linguistics*, 36(2), 229-245.

Dissertations:	12
Scientific publications:	220
Professional publications:	64

## Director: Prof. Ans van Kemenade

Ans van Kemenade worked at the Universities of Utrecht, Leiden and the Free University Amsterdam before she was appointed as a full professor of English Linguistics at Radboud University Nijmegen in 1999. She specializes in research on language variation and change, with a special focus on the comparative historical development of the grammatical systems of Dutch and English. She has published two high-impact research monographs and is currently working on a new monograph. She has a distinguished editorial track record, including four books and a number of collections for prestigious publishers and journals.



## Centre for Language Studies

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associated with this strategy have been spelled out in a previous publication. Empirical research carried out in South Africa by Prof. Carel Jansen reveals that the use of such rhetoric leads to misunderstanding without the expected advantage of people talking more about the campaign messages.

Various projects intended to create 'enriched publications' based on interviews with both war fighting and peacekeeping veterans were successfully completed. In collaboration with DANS and the Veteranen Instituut the interviews have been made available for research purposes; these are now searchable through automatically generated transcriptions.

The DigiPoli grant received by Dr Helmer Strik and Prof. Toni Rietveld will result in an adapted user interface for patients with language and speech disorders. Optimized language and speech technology will be used to make such an interface.

## Future research

The following grants, which were obtained in 2010, will substantially strengthen research at CLS in the years ahead.

- What makes a good listener?, NWO Vidi grant, Esther Janse. Period: April 2011-2016.
- Negerhollands database, CLARIN-NL, Muysken. Period: Feb.-Dec 2011.
- Integrated Parser and Lemmatizer Dutch in Retrospect (INPOLDER), CLARIN-NL, Van kemenade, Van Halteren and Rem. Period: Feb-Dec 2011.

- Integrating and publishing resources on sign language acquisition (IPROSLA), CLARIN-NL, Fikkert. Period: April-Dec 2011.
- Communicatie en Revalidatie DigiPoli (CRDP), ZonMw, Helmer Strik and Toni Rietveld. Period: Jan-Dec 2011.
- Extracting Dutch Factoids from Text, Google European digital Humanities Award, Suzan verberne, Lou Boves, Kees Koster, Period: Jan-Dec 2011.
- My Pronunciation Coach (MPC). STW Valorisation Grant (Phase 1), Helmer Strik, Catia Cuccharini, Liesbet Korebrits (Radboud in'to Languages), My Pronunciation Coach (MPC). STW Valorisation Grant (Phase 2), Helmer Strik, Catia Cuccharini and Liesbet Korebrits (Radboud in'to Languages)
- Aanpassing Spraaktechnologie bij Spraaktherapie van Dysartriepatienten, ZonMw, Helmer Strik. Period: April-Sept 2011.
- Opti-Fox, Louis ten Bosch, FP7-SME contract. Period: Nov 2010 - Nov 2012.
- SOMS (Second Opinion Muziekherkenningssysteem), Lou Boves. Period: June-October 2010.
- RealWorldSpeech, Internationaliseringssubsidie NWO, Bert Cranen. Period: Sept. 2010- Sept 2012.
- Masterplan Toepassingsgericht Onderzoek Taal-en Spraaktechnologie, Lou Boves, contract Nederlandse Taalunie. Period: Sept. 2010
- Controlled classroom: input and elementary forms of linguistic organisation, MaGW grant, Starren. Period: Jan 2011-Jan 2014.

# Behavioural Science Institute



The Behavioural Science Institute (BSI) conducts research on the fundamental principles and processes that govern human behaviour. A distinctive feature of BSI is a strong emphasis on an integrative approach to human behaviour that transcends the traditional disciplinary boundaries in contemporary research in psychology and education.



BSI – a research institute of the Faculty of Social Sciences – was accredited as a research school by the Royal Netherlands Academy of Arts and Sciences in 2006. The Institute offers a two-year Research Master's programme in Behavioural Science ([www.ru.nl/master/behaviouralscience](http://www.ru.nl/master/behaviouralscience)), which is taught within the BSI Graduate School (officially recognized by the Netherlands Organisation for Scientific Research – NWO – in 2010).

BSI researchers investigate the nature and development of social cognition and behaviour, executive control and automatic processes, as well as the dynamic interplay between biological and social-contextual factors in the development of human behaviour. Both normative behaviour and psychopathology are studied. Research paradigms include advanced experimental and quasi-experimental methods, virtual reality technology, psychophysiological measurement, behavioural and social neuroscience methods, behavioural genetics paradigms, randomized controlled trials and intensive longitudinal designs.

BSI research is integrated in six closely linked programmes:

## *Experimental Psychopathology and Treatment*

This programme focuses on abnormal psychology through the experimental study of cognitive and biological processes. Attention, interpretation, approach-avoidance, and memory are studied in

relation to different disorders, in order to assess their current status, control them, predict treatment success and relapse, and help prevent psychological dysfunctions among individuals who are at risk.

## *Developmental Psychopathology*

The central theme of this programme is the interplay between individual characteristics (e.g. personality, expectancies, implicit associations and genes), as well as environmental cues and social interactions, in relation to the development of psychopathology.

## *Learning and Plasticity*

Researchers in this programme explore the micro-analysis of learning and cognitive plasticity. The main focus is on the learning and development of communication and cognition in normal and atypical populations. Special attention is paid to the cognitive constraints related to learning a first and second language – both spoken and written – in terms of representation and control.

## *Social Cognition*

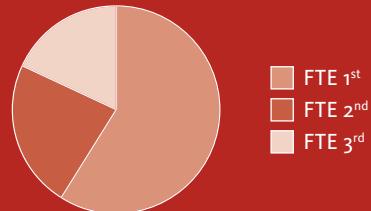
The main theme here is the interaction between automatic and controlled aspects of social behaviour. Several aspects are investigated, including the role of conscious and unconscious processes in judgment and behaviour, and the interaction between implicit and explicit components of attitudes, prejudice and self-esteem.

## Staff

Prof. R.B. van Baaren (o)	Prof. A.F.M. van Knippenberg (p)
Prof. L.J.M. van Balkom (e)	Prof. H.E.T. Knoors (e)
Prof. J.L.H. Bardoel (p)	Prof. M.A.J. Kompier (o)
Prof. E.S. Becker (o)	Prof. J.M. McQueen (o)
Prof. J.W.J. Beentjes (o)	Prof. A. van Minnen (e)
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Prof. A.J. Dijksterhuis (p)	Prof. J.W. Veerman (e)
Prof. J.I.M. Egger (e)	Prof. L.T.W. Verhoeven (o)
Prof. R.C.M.E. Engels (o)	Prof. R. Vonk (p)
Prof. J.R.M. Gerris (o)	Prof. F.P.J. Wester (o)
Prof. S.A.E. Geurts (p)	Prof. D.H.J. Wigboldus (o)
Prof. I. Granic (o)	Prof. C.L.M. Witteman (o)
Prof. J.G. van Hell (p)	
Prof. A.C. Huizink (e)	
Prof. G.J.M. Hutschemaekers (p)	
Prof. J.M.A.M. Janssens (p)	
Prof. C.A.J. de Jong (e)	

<b>Tenured</b>		
Full Professors	11.1	FTE
Associate Professors	7.4	FTE
Assistant Professors	11.8	FTE
Researchers	1.1	FTE

<b>Non-tenured</b>		
Researchers	16.1	FTE
Doctoral candidates	65.3	FTE



### Social Development

Researchers in this programme study fundamental processes of typical and atypical social development and related cognitive processes over the life span from a behavioural, psychobiological, and neuroscience perspective. Clinical applications are also investigated. Areas of research include early child development and child care, peer relationships, ADHD, cognitive and motor processes in typical and visually impaired children, as well as successful aging among older adults.

### Work, Stress and Health

The purpose of this programme is to arrive at a better understanding of both adaptive and maladaptive human behaviour in the psychosocial work context by combining basic scientific theories with applied research. The fundamental goal is to advance knowledge of the cognitive, motivational and physiological processes that underlie work behaviour. The applied goal is to provide evidence-based guidelines for designing and redesigning healthy jobs, preventing stress, and promoting motivation, learning, performance and recovery.

In September 2010 a new research group 'Communication and Influence' became part of BSI. This group, which is managed by Prof. Rick van Baaren, includes 'Communication science' researchers who previously worked in NISCO. The main research issues involve

communication and media, social influence and behavioural change. This groups' research will be internally evaluated in 2013.

### Awards

- Prof. Ad van Knippenberg received the Lifetime Achievement Award from the European Social Cognition Network.
- Dr Anouk Scheres received an ASPASIA award to supplement her NWO Vidi Award.
- PhD student Thao Ha, MSc won the 2010 Frye Stipendium award.
- Dr Gero Lange won the Hendrik Casimir-Karl Ziegler fellowship for 2010-2011 from the Royal Netherlands Academy of Arts and Sciences (KNAW).
- Dr Julie Krans won the Niels Stensen stipendium and an NWO Rubicon grant.
- PhD student Ron Dotsch, MSc won an NWO Rubicon grant.
- PhD student Oliver Langner, MSc won an NWO Rubicon grant.
- Dr Rien Breteler won the Publication Award of the Foundation for Neurofeedback and Applied Neuroscience.
- PhD student Verena Ly, MSc won an NWO Mozaiek grant.

### Research facilities

The Behavioural Science Institute has excellent research facilities:

- Two Virtual Reality (VR) Labs with sophisticated computers, utilizing high-end stereoscopic video processors, projection, and tracking systems to create immersive, three-dimensional

# Behavioural Science Institute



Dr Anouk Scheres (Associate Professor) won an NWO Vidi grant. She studies motivation, sensitivity to rewards and self-regulation among children and teenagers suffering from ADHD.



computer generated environments in which participants can move around freely.

- Two mobile labs, with flexible furnishing, can be used to accommodate different experimental setups outside university (EEG recordings, computerized tests, observations of interactions between subjects). This facilitates research with young participants (e.g. children can be visited at schools).
- The Physiological Measurements laboratory has state-of-the-art facilities (including EEG) for measuring the neurocognitive and biochemical mechanisms involved in behaviour. These facilities are shared with the Donders Centre for Cognition.
- Eye-tracking equipment with high temporal resolution (500-1250 Hz) is available for research on visual attention and eye movements. For mobile use and 3-D stimuli, two Tobii T120 Eye-trackers are available.
- A Driving Simulator allows for ecologically valid measurements of driving capacities and the study of higher-order cognitive processes during driving.
- The observational laboratory comprises several child-proof rooms with one-way screens and multiple cameras.
- The computer laboratory consists of 22 identical cubicles, each with a PC and software designed for computerized experiments. Licenses are available for various research-related software packages, including packages that enable on-line research.
- The Bar Lab (with unobtrusive cameras, recording devices, and a professional beer tap) is used for observation studies of social behaviour in a natural setting.

## Collaboration

Within BSI there is a great deal of collaboration among researchers, both within and between research programmes. In addition to this fruitful internal cooperation, researchers at the BSI actively collaborate with many external partners. They also cooperate with

the following partners in the International Research Universities Network (IRUN): Université de Poitiers, University of Münster, and University of Glasgow; and also with two preferential partners of Radboud University Nijmegen: the University of North Carolina and the University of Leuven.

Researchers in Experimental Psychopathology and Treatment collaborate formally with a range of partners, including S. Hofmann (Boston), the DICE (Decision, Intuition, Cognition and Emotion) group at the University of Bergen, and Maranatha University in Indonesia. The Developmental Psychopathology programme has a formal collaboration arrangement with the Trimbos Institute. Collaborative ventures have been established with Professors Mitch Prinstein (University of North Carolina), James Sargent (Dartmouth Medical School), Luc Goossens (University of Leuven), Peter Herman (University of Toronto), Silvia Ciarano (University of Torino) and Dr Emmanuel Kuntsch (Lausanne). In the programme Learning and Plasticity, collaboration continued with Pittsburgh University (visiting professor Charles Perfetti), with Pennsylvania State University (visiting professor Janet van Hell), with the University of Cincinnati, the National Technical Institute for the Deaf at Rochester and the Max Planck Institute for Psycholinguistics (Nijmegen). Researchers of the Social Cognition programme collaborate with professors Vincent Yzerbyt (University of Leuven), Marcel Brass (University of Ghent), Eli Finkel (Northwestern University, Illinois) and Alex Todorov (Princeton University). Researchers from Social Development have collaborative research projects with professors Ron Barr (University of British Columbia), Jens Pruessner (McGill University), William Bukowski (Concordia University), Marlene Sandstrom (Williams College), Kathryn LaFontana (Sacred Heart University), and Brett Laursen (Florida Atlantic University). The Work, Stress and Health programme has a formal collaboration arrangement with the Work and Employment

division at TNO (Dr Irene Houtman, Prof. Paulien Bongers) and Radboud University Nijmegen Medical Centre. There are also collaborative projects with Professors Sabine Sonnentag (University of Mannheim), Toon Taris (Utrecht University), and Dr Goran Kecklund (University of Stockholm) and Dr Jos Brosschot (Leiden University).

### Research results

Within the programme Experimental Psychopathology and Treatment numerous studies were conducted on automatic approach-avoidance tendencies, including diverse disorders such as social anxiety, spider phobia and alcohol addiction. It was found that addicts with dysfunctional alcohol-approach tendencies can be re-trained and the risk of relapse can be reduced (Wiers *et al.*, in press). The VR Lab was used extensively to study automatic aspects of avoidance and imitation in anxiety disorders (Rinck *et al.*, 2010a, 2010b; Vrijen *et al.*, 2010a, 2010b). Studies on decision making focused on mental health clinicians (De Kwaadsteniet *et al.*, 2010), and research on eating behaviour addressed gene-environment interactions (Van Strien *et al.*, 2010).

Within the Developmental Psychopathology programme it was demonstrated that adolescents with the DRD2 risk gene are most susceptible to start drinking when they have permissive parents (Van der Zwaluw *et al.*, 2010). Studies on imitation show that a) young people with the DRD4 risk gene are most susceptible to peer drinking when in a social drinking setting (Larsen *et al.*, 2010), b) being with a restrained eater strongly affects people's breakfast intake (Hermans *et al.*, 2010) and exposure to alcohol portrayals in movies affect immediate drinking (Koordeman *et al.*, 2010). Longitudinal and diary studies reveal new insights into the impact of dynamic levels of self-efficacy on both initiation as well as successful smoking cessation among adolescents (Hiemstra *et al.*, 2010; Van Zundert *et al.*, 2010).

Within the Learning and Plasticity programme it was demonstrated which cognitive and linguistic markers relate to speech perception (Sjerps & McQueen, 2010), phonological awareness (Gijssel *et al.*, 2010), code-switching (Kootstra *et al.*, 2010) and motor planning (Ter Horst *et al.*, 2010). Moreover, it was shown how linguistic processes vary in deaf and hearing children (Ormel *et al.*, 2010), second language learners (Van Hell & Tokowicz, 2010), and children with pragmatic impairment (Ketelaars *et al.*, 2010). New insights were also gained into the intervention of learning in populations with mental disabilities (Van Vonderen *et al.*, 2010), language impairment (Van Balkom *et al.*, 2010), motor impairment (Crajé *et al.*, 2010) and visual impairment (Withagen *et al.*, 2010). Finally, the role of school diversity on student learning was highlighted (Denessen *et al.*, 2010).

Research in Social Cognition showed that unconscious thought processes indeed take place off-line rather than on-line (Strick *et al.*, 2010), as had been suggested by others, and that unconscious thought theory can be applied to medical decision making (De Vries *et al.*, 2010). The group also joined the debate on the relationship between consciousness and attention (Dijksterhuis *et al.*, 2010). In addition, research on relationships showed that executive functioning strongly determined whether people are able to forgive (Pronk *et al.*, 2010). An important contribution was the physiological demonstration that the relationship between familiarity and affect was mediated by mood (De Vries *et al.*, 2010).

Research in Social Development documented the effects of prenatal stress on infant development (Beijers *et al.*, 2010; Jansen *et al.*, 2010). Albers *et al.* (2010) examined the effects of child care centres on infants' cognitive development. Burk (2010) conducted a statistical study on variance partitioning in mother-adolescent dyadic data. Peters *et al.* (2010) examined the associations of children's friendships with peer acceptance and popularity; Stevens (2010) found cohort changes in the importance of friendships among adults over a period of 17 years. Scheres *et al.* (2010) discovered that temporal reward discounting is not a uniform construct but has two components. Custers *et al.* (2010) developed a method for observing the quality of care provided to residents in somatic nursing homes and found associations with residents' well-being.

Within the Work, Stress and Health programme, De Bloom *et al.* (2010; in press) found that a vacation from work has positive effects on health and well-being for most employees and that vacation activities and experiences explain the positive (and negative) changes in health during vacations. In a quantitative review and experimental work on the relationship between task characteristics and learning, Wielenga-Meijer *et al.* (2010a, 2010b) found strong evidence for a positive relationship between job demands and autonomy and motivational and meta-cognitive learning processes. Wagenaar *et al.* (2010) demonstrated that within the European Union the quality of working life is worse among temporary workers than among permanent employees.

### Societal impact

- The BSI collaborates closely with the Academic Centre for Social Sciences (ACSW) in joint externally funded projects on mental health-related topics.
- Prof. Rutger Engels, Dr Haske van der Vorst, and Dr Marloes Kleinjan collaborate intensively with the Trimbos Institute on prevention and intervention programmes focusing on substance use.
- Prof. Clemens Hosman is Vice Chair of the World Consortium for the Advancement of Prevention and Promotion in Mental Health, in which 17 international organizations are involved. Since 2010 he has chaired the International Taskforce for Capacity Building and Workforce Development.
- Prof. Ludo Verhoeven heads the National Language Education Centre, which was set up to improve the teaching and learning of Dutch language and literacy at Dutch primary schools.

# Behavioural Science Institute

## Key publications

Andics, A.V., McQueen, J.M., Petersson, K.M., Gal, V., Rudas, G. & Vidnyanszky, Z. (2010). Neural mechanisms for voice recognition. *Neuroimage*, 52(4), 1528-1540.

Bloom, J. de, Geurts, S.A.E., Taris, T.W., Sonnentag, S.E., Weerth, C. de & Kompier, M.A.J. (2010). Effects of vacation from work on health and well-being: Lots of fun, quickly gone. *Work and Stress*, 24(2), 196-216.

Crajé, M.C., Aarts, P.B., Nijhuis-Van der Sanden, M.W.G. & Steenbergen, B. (2010). Action planning in typically and atypically developing children (unilateral cerebral palsy). *Research in Developmental Disabilities*, 31(5), 1039-1046.

Dijksterhuis, A.J. & Aarts, H.A.G. (2010). Goals, Attention, and (Un)Consciousness. *Annual Review of Psychology*, 61, 467-490.

Hendriks, G.J., Keijsers, G.P.J., Kampman, M., Oude Voshaar, R.C. & Hoogduin, C.A.L. (2010). Agoraphobic Cognitions in Old and Young Patients with Panic Disorder. *American Journal of Geriatric Psychiatry*, 18(12), 1155-1158.

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Lange, A.H. de, Taris, T.W., Jansen, P.G.W., Kompier, M.A.J. & Bongers, P.M. (2010). On the relationships among work characteristics and learning-related behavior: Does age matter? *Journal of Organizational Behavior*, 31(7), 925-950.

Larsen, H., Zwaluw, C.S. van der, Overbeek, G.J., Granic, I., Franke, B. & Engels, R.C.M.E. (2010). A Variable-Number-of-Tandem-Repeats Polymorphism in the Dopamine D4 Receptor Gene Affects Social Adaptation of Alcohol Use. Investigation of a Gene-Environment Interaction. *Psychological Science*, 21(8), 1064-1069.

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Pronk, T.M., Karremans, J.C.T.M., Overbeek, G.J., Vermulst, A.A. & Wigboldus, D.H.J. (2010). What It Takes to Forgive: When and Why Executive Functioning Facilitates Forgiveness. *Journal of Personality and Social Psychology*, 98(1), 119-131.

Roekel, G.H. van, Scholte, R.H.J., Verhagen, M., Goossens, L. & Engels, R.C.M.E. (2010). Loneliness in adolescence: gene x environment interactions involving the serotonin transporter gene. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 51(7), 747-754.

Roelofs, K., Hagenaars, M.A. & Stins, J.F. (2010). Facing Freeze: Social Threat Induces Bodily Freeze in Humans. *Psychological Science*, 21(11), 1575-1582.

Scheres, A.P.J., Tontsch, C., Thoeny, A.L. & Kaczkurkin, A. (2010). Temporal Reward Discounting in Attention-Deficit/Hyperactivity Disorder: The Contribution of Symptom Domains, Reward Magnitude, and Session Length. *Biological Psychiatry*, 67(7), 641-648.

Smeekens, S., Riksen-Walraven, J.M.A., Bakel, H.J.A. van & Weerth, C. de (2010). Five-year-olds' cortisol reactions to an attachment story completion task. *Psychoneuroendocrinology*, 35(6), 858-865.

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Dissertations: 14  
Scientific publications: 453  
Professional publications: 82

- Prof. Marianne Riksen-Walraven appeared regularly in the media as an expert on child care and the development of young children, including interviews on Netwerk TV and in the national newspapers Volkskrant, NRC, Trouw.
- Prof. Nan Stevens and Dr Yolande Kuin were interviewed by Trouw as experts on successful aging among older adults in the Netherlands.
- Dr Tatjana van Strien and her research on eating behaviour received attention on VARA television as well as in newspapers such as Volkskrant and The Sunday Times. She is also the university's COTAN representative (Commissie Test Aangelegenheden NIP), and a member of the Dutch Health Board (Gezondheidsraad) committee on preventing overweight/eating disorders.
- PhD student Rebecca de Leeuw, MSc received considerable media attention for her research on parental effects on child smoking

## Director: Prof. Michiel Kompier

Prof. Michiel Kompier has been Professor of Work and Organizational Psychology at Radboud University Nijmegen since 1995. He previously worked at the Universities of Groningen and Amsterdam, and at TNO Work and Employment. His research interests include mental workload, work stress, fatigue, job design, motivation, work time arrangements, intervention research, and working conditions policies.



## Behavioural Science Institute

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and the effects of watching movies on sensation seeking and smoking in adolescents (including in various newspapers and on youth television).

- PhD student Hella Larsen's MSc's research on genetic susceptibility and modelling effects on drinking received a great deal of national and international media coverage and she appeared in the TV programme NOVA in Spring 2010.
- PhD student Jessica de Bloom MSc's research on the effects of vacation on health and well-being received wide media coverage on radio, TV, and in newspapers.

## Future research

BSI was very successful in obtaining grants for fundamental and applied research from the NWO and the Dutch Organisation for Health Research and Innovation (ZonMw). New PhD projects funded by the NWO included four 'Brain and Cognition' projects on cross-modal learning, word learning in context, reading intervention (Prof. Ludo Verhoeven), and decision making under pressure (Prof. Ad van Knippenberg). Another two projects received awards from 'Youth and Family', for work on forgiveness among peers (Dr Johan Karremans), and bullying in children (Dr Gerbert Haselager). From 'Brain and Cognition' two postdocs and two other PhD projects were funded (Prof. Janet van Hell on second language learning and Prof. Bert Steenbergen on motor learning). Dr Agnes Tellings received a large NWO grant for an inventory of written language input to children. PhD projects funded by ZonMw were a project on preventing depression (Dr Rinka van Zundert), alcohol prevention (Dr Haske van der Vorst), and work-time control interventions (Dr Debby Beckers). Researchers at BSI were also successful in acquiring contracts for PhD projects and other research, for example from the Astmafonds.

Other highlights that will impact our future research are:

- A ZonMw grant was obtained for the development of Academic Centre Youth Nijmegen (ACYN), a multi-disciplinary collaboration on prevention, treatment, policy, research, teaching and training in relation to internalizing and externalizing problems (Principal Investigator [PI]: Prof. Rutger Engels).
- Two Veni projects (led by Dr Marloes Kleinjan and Dr Haske Van der Vorst) and a Vidi project (Dr Anouk Scheres) got underway. The Veni awards will provide insight into the precursors of alcohol use in children as well as the relationship between gene-environment interactions and adolescent smoking. The Vidi project will focus on the neuropsychology of children with ADHD.
- A new research line on mechanisms and processes in research on dealing with problem youth was started by Prof. Isabela Granic (in 2010 appointed as 'Top Researcher' by the Board of Radboud University Nijmegen), along with three new projects on the treatment of anxiety disorders and prevention of depression. A new PhD project on loneliness in youth will be funded by the Leuven Convenant (Dr Ron Scholte).
- BSI is affiliated to the Donders Institute for Brain, Cognition and Behaviour. Collaboration with the Donders Centre for Cognition will be intensified through six interdisciplinary PhD projects. In cooperation with PI Dr Alan Sanfey, BSI members will increasingly include neurocognitive measures in their research. Professors Ludo Verhoeven (BSI) and Guillen Fernandez (DCC) will collaborate in a joint lab group on Brain and Education.
- Thanks to a successful application to become an NWO-acknowledged Graduate School, BSI received a grant for four new PhD projects. Each project will be supervised by BSI members from various research programmes in order to further strengthen internal cooperation. These projects will start in 2011.

# Donders Institute for Brain, Cognition and Behaviour

Neuroscience & Behavioural Science and Language & Cognition are two of the key research topics at Radboud University Nijmegen. The research focuses on cognition and behaviour in humans as well as work on the neuronal substrate, including the genetic, molecular and cellular processes that underlie cognition and behaviour. This scope reflects a broad spectrum of research, extending 'from Molecule to Man'.

## Understanding mind and brain

The Donders Institute (DI) for Brain, Cognition and Behaviour at Radboud University Nijmegen is a leading centre of expertise with a strong international reputation. The institute is young, has an enterprising spirit and an excellent track record of research on Brain, Cognition and Behaviour. Its scientific output is prolific and renowned for its quality. Key success factors include a highly interdisciplinary approach. The breadth of the DI, which spans the faculties of Natural Sciences, Social Sciences and the University Medical Centre, is unrivalled worldwide. Collaboration extends beyond the borders of the institute, both nationally and internationally. Chair of the board of directors, Peter van Hagoort: "Our state-of-the-art research equipment attracts researchers from all over the world. This enhances our own research, as visiting researchers interact with our research groups. We're also closely affiliated with the Max Planck Institute for Psycholinguistics and the University's Centre for Language Studies, creating strong links with the excellent language research tradition in Nijmegen."

## Critical mass and focus

Over 500 researchers work at the DI on unravelling the mechanisms of the brain. Thanks to the integration of basic sciences in the institute, there is also a strong theoretical approach. The research includes exploring cognition and behaviour in humans as well as work on the neuronal substrate, including the genetic, molecular and cellular processes that underlie cognition and behaviour. The DI's full spectrum of research 'from Molecule to Man' is structured within four main themes:

### *Language and Communication*

Studying Language and Communication involves understanding core language and communication operations and working out how these are grounded in (or related to) other domains of cognition, including perception, action, memory, and sociality. An important goal is to determine how the human language faculty is rooted in the 'language-ready' human brain.

### *Perception, Action and Control*

Researchers working on Perception Action and Control study the basic sensorimotor aspects as well as the cognitive, contextual, and social components of perception action coupling and their clinical implications and relevance for robotics. Research methods include theoretical analysis, psychophysical and behavioural studies, neurophysiological techniques, neuroimaging, clinical and pharmacological interventions, and developmental and genetic approaches.

### *Learning, Memory and Plasticity*

The development and decay of the healthy and the maladaptive brain is the main focus of researchers working on Learning, Memory and Plasticity. They study the mechanistic underpinnings and behavioural consequences of long-term changes in neural structure and function. Genetic, molecular and cellular methods, animal models, as well as human neuroimaging and cognitive neuropsychology are used.

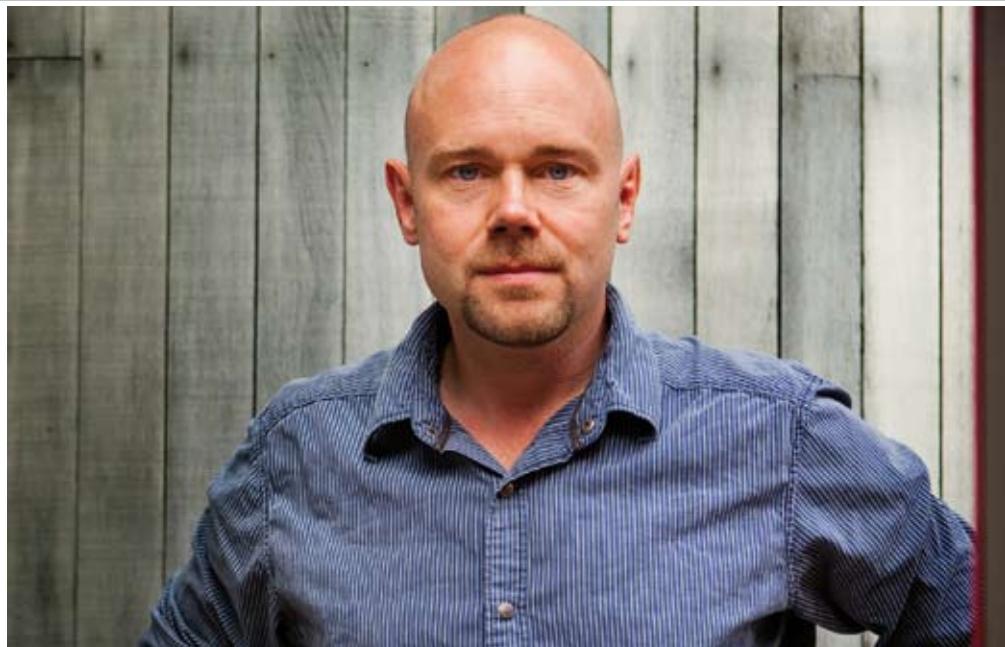
### *Brain Networks and Neuronal Communication*

This theme centres on brain networks, ranging from the very smallest – communication between individual neurons – to the largest: communication between different brain areas and the outside world. The research groups combine developing new techniques for electrophysiological and anatomical measurements of connectivity and activation with data analysis and the experimental application of these techniques in studies of cognition in humans, non-human primates and rodents. Computational modelling is an important component, integrating multi-level experimental data in an attempt to arrive at a clearer understanding of cognitive processes.

### *Benefits for society*

The research conducted at the Institute has considerable potential for benefiting society. In future the intention is to tailor programmes to individual needs. It may well even be possible to use neuro-feedback to alleviate a range of psychiatric and neurological symptoms. A better understanding of the brain's connectivity patterns could also help predict the course of recovery in diseases such as stroke.

Dr Ole Jensen (Researcher)  
– an expert in Brain Networks and Neuronal Communication – received an NWO Vici grant. His work focuses on neuronal oscillations and their influence on human brain regulation.



## The Donders Graduate School for Cognitive Neuroscience

In order to train young talent in the broad field of cognitive neuroscience, the Institute has established a graduate school, which offers students a high-quality educational programme at both the Master's and the PhD level. The school is intended for the best international students in biology, physics, psycholinguistics, behavioural studies and medicine who are strongly motivated to do research in cognitive neuroscience. Indeed the Donders Graduate School for Cognitive Neuroscience (DGCN) attracts triple-A students (Active, Ambitious and Autonomous) and DGCN Master's graduates are much in demand around the world.

Brain research clearly benefits from cooperation across disciplines, which is why the training programmes are mostly cross-disciplinary. Students experience a range of aspects of the Institute before they start on their own research. And it's not only the trainees who profit from this approach. All of the researchers who are involved in the DGCN are able to extend their expertise by working together with colleagues who are tackling brain research from a different angle.

The DGCN is officially recognized as a national graduate school within the NWO Graduate School Programme that's endorsed by the Dutch minister of Education and the MSc programme is approved by the Accreditation Organisation of the Netherlands and Flanders (NVAO). In 2010 the MSc programme came first in Elsevier's national ranking of Dutch university and polytechnic programmes.

## Future developments

In 2010 the Donders Institute was evaluated by a committee of reputable scientists, who were impressed with the structures that had been established over the past two years. They were also enthusiastic about the decision to focus on neurosciences at the systems level. This focus places the Institute in a unique position within the Netherlands and makes it a major player internationally. The four themes were judged to be well chosen, reflecting the strong research areas at the Institute.

Based on the recommendations of the committee a Scientific Advisory Board of renowned international experts will be established in 2011. Furthermore the Institute will strengthen the coherence of its research, for example by aiming to establish permanent chairs in fields such as Language and Pathology.

[www.ru.nl/donders](http://www.ru.nl/donders)

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognition

The Donders Centre for Cognition (DCC) is one of the three centres at the Donders Institute for Brain, Cognition and Behaviour. At DCC, scientists from a range of disciplines jointly study the psychological, formal and neurobiological principles of information processing in biological and artificial cognitive systems. The Royal Netherlands Academy of Arts and Sciences renewed DCC's accreditation in December 2007 and the centre continues to play a central role in the University's research focus on Cognitive Neuroscience.



The research collaboration with the Donders Centre for Cognitive Neuroimaging (DCCN) and the Donders Centre for Neuroscience (DCN) takes place within the four Donders research themes: Language and Communication (LC), Perception, Action and Control (PAC), Learning, Memory and Plasticity (LMP) and Brain Networks and Neuronal Communication (BNNC). The DCC has five research divisions.

### *Psycholinguistics (PL)*

Researchers in Psycholinguistics study the cognitive processes and representations underlying the use of language in a variety of contexts, including speaking, reading, and listening at the word, sentence, and discourse level. Various techniques are used, including reaction time studies, eye-tracking, neuro-imaging, and computational modelling, with a special research focus on Contextual Flexibility and Multilingualism.

### *Action, Intention and Motor control (AIM)*

The objective of this division is to advance the study of the basic sensorimotor aspects as well as the cognitive, contextual and social components of perception-action coupling. Research methods include clinical and behavioural studies, neurophysiological and neuroimaging techniques, developmental and genetic approaches,

and computational modeling. Key focus areas include Sensorimotor Integration, Intention and Control, and Social Interaction.

### *Biological Psychology (BP)*

The Biological Psychology research group aims to bridge the gap between cognitive and systemic neuroscience on the one hand and basic neuroscience on the other. The methodological spectrum is very wide-ranging, from animal research via behavioural, EEG and neuroimaging studies in healthy participants to studies in selected groups of neurological and psychiatric patients. Biological Psychology researchers have made significant contributions to the field of Cognitive Control, with a specific focus on performance monitoring in the context of Learning, Memory and Plasticity and Brain Networks and Neuronal Communication.

### *Neuropsychology and Rehabilitation Psychology (NRP)*

Research within the division of Neuropsychology and Rehabilitation Psychology focuses on the interplay between executive control, learning and memory using interdisciplinary, patient-centered studies or aging individuals in combination with structural and functional neuroimaging methods. This research is integrated with work on Learning, Memory and Plasticity and Perception, Action and Control.

## Staff

Prof. H. Bekkering (o)

Prof. A. Cutler (e)

Prof. P.W.M. Desain (o)

Prof. A.F.J. Dijkstra (p)

Prof. J.I.M. Egger (e)

Prof. L. Fasotti (e)

Prof. P. Hagoort (o)

Prof. R.P.C. Kessels (o)

Prof. G.K. Knoblich (p)

Prof. J.M. McQueen (o)

Prof. R.G.J. Meulenbroek (p)

Prof. R. Schreuder (p)

Prof. H.J. Schriefers (o)

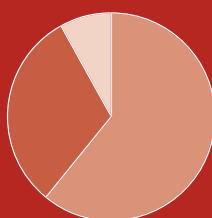
Prof. M. Ullsperger (o)

### Tenured

Full Professors	5.4 FTE
Associate Professors	4.0 FTE
Assistant Professors	5.5 FTE
Researchers	1.7 FTE

### Non-tenured

Researchers	9.8 FTE
Doctoral candidates	35.8 FTE



■ FTE 1<sup>st</sup>  
■ FTE 2<sup>nd</sup>  
■ FTE 3<sup>rd</sup>

### Cognitive Artificial Intelligence (CAI)

The research focus of this division is on cognition as well as communication and cooperation in humans, their environment and artificial systems. The main research topics are Brain Computer Interfaces (within Brain Networks and Neuronal Communication) and Theoretical Cognitive Science (within Perception, Action and Control).

### Research facilities

- A Baby Lab, including a Tobii eye-tracker and a 48-channel active EEG setup.
- A vestibular sled with combined EEG apparatus (96 channels) and motion-tracking devices.
- Several EEG/ERP laboratories for measuring brain activity during cognitive tasks and online processing in Brain-Computer Interfacing.
- Laboratories with 2D and 3D motion-tracking systems for measuring movements and trajectories during the execution of tasks such as reaching, grasping and manipulating objects.
- 'Reach-in' 3D-visualization and force-feedback machinery, allowing experiments on manual actions in three-dimensional virtual reality.
- A Cognitive Artificial Intelligence laboratory, which is used

to analyse human-computer interaction, the dynamics of intelligent behaviour, 'embedded embodied cognition' and information retrieval.

- A laboratory and studio for research on auditory perception and music cognition.
- Several laboratories for behavioural studies using visual/auditory stimuli.
- Animal laboratories for long-term electrophysiological recordings using rats with chronically implanted electrodes and learning studies.
- Facilities for stereotactic animal operations.
- A biochemical laboratory for identifying brain substances.

In addition, DCC researchers have access to the brain-imaging facilities of DCCN (fMRI, MEG and EEG).

### Awards and acknowledgements

- Prof. H. Bekkering became a member of the Scientific Advisory Board of the national Initiative Brain & Cognition.
- Dr W.P. Medendorp became a member of the editorial board of NeuroImage and a scientific review associate of the European Journal of Neuroscience.
- Dr N. Sebanz: Young Mind and Brain Prize 2010.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognition



Dr Luc Selen (Researcher), who carries out research on the brain's response to unexpected movements, received an NWO Veni grant. He performs his research at the vestibular sled laboratory, where a chair is mounted on rails and powered by a linear motor to precisely control human motion. See picture p. 60.



- Dr L. Selen: Veni grant for the project: 'Reaching in motion: sensorimotor computations for reaching in accelerating reference frames'.
- Research grant: 'What is a mental simulation?' (the Netherlands Organisation for Scientific Research – NWO – programme 'Brain and Cognition: An Integrated Approach'; main applicant: Dr Ivan Toni).
- Research grant: 'Joint Action: The Role of Motor Simulation and Cognitive Control in Young Children and Adults' (NWO Programme 'Brain and Cognition: An Integrated Approach'; main applicant: Prof. H. Bekkering, co-applicant: Dr S. Hunnius).
- Research grant: 'Postural instability and gait disability' (Prinses Beatrix Fonds; main applicant: Dr B. Bloem; co-applicant: Dr I. Toni).
- Research grant: 'Learning auditory categories by means of brain signals' (STW OTP; main applicants: Prof. P. Desain and Prof. J. McQueen).
- Research grant: 'Errorless learning of executive function strategies' (FES; main applicants: Prof. R. Kessels and Prof. L. Fasotti).
- KNAW award to fund research of Cognitive Neuroscience Research Master's students ('Akademieassistenten'; main applicant: Prof. R. Meulenbroek).
- Prof. L. Fasotti was appointed chairman of the 'Wetenschappelijke Adviesraad' of the Hersenstichting.

### Collaboration

The DCC collaborates with the following preferential partners of the international research universities network IRUN:

- Jagiellonian University Kraków, Poland: PhD project 'ERP studies on sentence processing in Polish'. Master student project on 'Form interference in L2 word learning'.

- Westfälische Wilhelms-Universität Münster, Germany, MEG project on performance monitoring and cortical folding pattern of medial frontal cortex.

The DCC is also engaged in structural collaboration with many other academic institutions, including:

- Max Planck Institute Neurological Research and University Hospital Cologne Germany: 'Effects of deep brain stimulation in Parkinson's and Tourette's syndromes and obsessive-compulsive disorder on performance monitoring'.
- Bergen University, Norway: single-trial analyses, pre and post-error (mal)adaptation.
- Oldenburg University, Germany: published a book on EEG/ fMRI together.
- York University, Canada: Goal-directed movement control.
- Western Ontario University, Canada: Neuroimaging of perception and action.
- Minho University, Portugal: Cognitive robots.
- University College London, UK: Implicit memory and precision of working memory.
- Université d'Angers, France: Cognitive rehabilitation.
- Oldenburg University, Germany: False recognition and memory impairments.
- Cambridge University, UK: The Shortlist B model of spoken-word recognition.
- Leipzig University, Germany: Advance planning in sentence production, automatic lexical activation of objects.
- University of Edmonton, Canada: Japanese-English bilinguals, morphological family size effects in bilinguals.
- Katholieke Universiteit Leuven, Belgium: Perceptual organization.

## Research results

### *Language and communication*

Bilingual studies, supported by simulations, revealed that translation equivalents with orthographic overlap (cognates) activate shared semantic representations, depending on the degree of overlap. By studying L2 fossilization in a new individual-oriented approach, it was shown that L2 learners are sensitive to the discrepancy between L2 input and their own internal representations. Electrophysiological studies on speaking revealed endogenous and other effects of executive control in switching attention between languages in Stroop tasks and overt picture naming. Cognitive load affected advanced planning during sentence production and the length of prosodic breaks affected the syntactic analysis of sentences when listening.

### *Perception, Action and Control*

In 2010 fMRI recordings established the neural frames of reference that are involved when planning eye and hand movements. Also, magnetoencephalography delivered new insights into the mechanisms underlying effector selection in the human brain. Furthermore, empirical evidence was provided that human communicative abilities are supported by different cerebral structures than those sustaining sensorimotor processes or linguistic skills. Moreover, the finding that people learn to comprehend a new dialect better after imitating it, compared to several other training methods, strongly suggests the involvement of the language production system in language comprehension.

In two neuroimaging studies, researchers in the Biological Psychology division disentangled two different types of adaptation to performance problems. Errors lead, on the one hand, to general motor inhibition, resulting in slower reaction times during subsequent trials (this effect is called post-error slowing). On the other hand, task-specific focusing of attention is implemented by top-down control, thus suppressing distracting information and enhancing the processing of task-relevant input.

Researchers in the Neuropsychology and Rehabilitation Psychology division demonstrated that disturbed error-monitoring processes play a key role in psychopathy. Furthermore, this division reported clinically relevant findings showing that memory function correlates with CSF biomarkers only in the early stages of Alzheimer's dementia, but not in later stages, and they identified a rare genetic variant of pre-senile dementia.

### *Learning, Memory and Plasticity*

A new taxonomy of working-memory binding was proposed by researchers in the Neuropsychology and Rehabilitation Psychology division. Furthermore, it was shown that cognitive inhibition mediates experimentally induced pain sensitivity and reveals asymmetries in visuospatial attention, even in patients with subclinical neglect symptoms.

### *Brain Networks and Neuronal Communication*

Researchers in the Biological Psychology division have shown that orienting attention to an upcoming event involves spatially and temporally specific modulations of sensorimotor oscillations. Furthermore, for the first time it was demonstrated that phase-amplitude coupling patterns are spatially distributed, suggesting that this phenomenon plays a central role in communication between distant brain areas.

Modeling cognitive process and testing these models on empirical data is central to the Cognitive Artificial Intelligence division, where research revealed a surprisingly close representation of imagined and perceived music and the integration of the sensorimotor representation of simultaneous finger stimulation.

### *Societal impact*

DCC researchers contribute to the dissemination of fundamental research and its technological and educational applications via teaching programmes, public conferences and the media.

There were numerous media appearances, in both Dutch and international media. For example Dr R. van Lier was called in as an expert for the Teleac radio programme 'Hoe? Zo!', Dr M. Jongsma was interviewed for the 'Giel Beelen' radio show on pain research. There was extensive attention in international TV and radio programmes (including the BBC) for an article on 'Imitation Improves Language Comprehension' by Dr P. Adank, Prof. P. Hagoort and Prof. H. Bekkering.

The Neuropsychology and Rehabilitation Psychology division is particularly active in informing patients and the general public, for example at a conference on modern care for patients with dementia (Congres Moderne Dementiezorg, De Gelderlander, VWO voorlichting). In September 2010 a researcher's night in the Lux cultural centre in Nijmegen presented the results of the Brain-Gain project on Brain-Computer and Computer-Brain interfaces to a wide audience.

Together with Philips, Prof. P. Desain and Prof. S. Gielen founded a Dutch innovation platform for the valorization of Brain and Cognition science, which has received broad support from both small and medium-sized companies and academic institutions. Prof P. Desain led the team that formulated and published a Strategic Research Agenda, which will be used as the basis for future applications for funding.

Recently, there has been an extension of joint-action research to include sports psychology.

Dr Natalie Sebanz was interviewed by *Nature* about academic tenure systems in Europe (*Nature*, 468, 123-125).

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognition

### Key publications

Adank, P.M., Hagoort, P. & Bekkering, H. (2010). Imitation Improves Language Comprehension. *Psychological Science*, 21(12), 1903-1909.

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Dissertations: 17

Scientific publications: 184

Professional publications: 39

## Director: Prof. Harold Bekkering

Prof. Harold Bekkering has been Professor of Cognitive Psychology at Radboud University Nijmegen since 2002 and since 2008 he has been the director of the DCC. Previously, he worked at the Universities of Maastricht, St. Louis and Groningen and was a senior scientist at the Max-Planck Institute for Psychological Research in Munich. Prof. Bekkering's research interests include Developmental and Cognitive Psychology, Cognitive Neuroscience and the implementation of Cognition in Robotics.



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## Future research

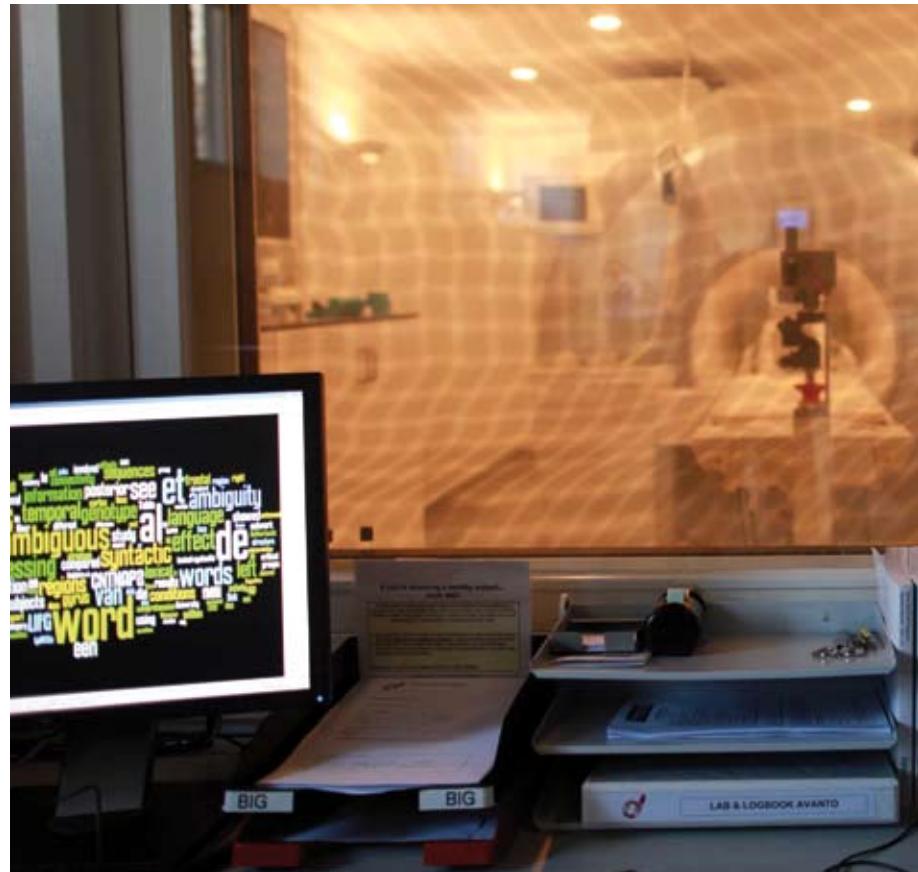
The rapidly developing research cooperation within the Donders Institute for Brain, Cognition and Behaviour is strengthening the multi-disciplinary approach to studying the structure and function of the brain in relation to goal-directed behaviour.

Research in 2011 will make use of new grants required in 2010. These include the STW OTP grant for Prof. Dr J. McQueen and Prof. P. Desain's 'Learning auditory categories by means of brain signals' and NWO Brain and Cognition grants for Dr I. Toni's project 'What is a mental simulation?' and for Prof. H. Bekkering's project 'Joint Action: The Role of Motor Simulation and Cognitive Control in Young Children and Adults'. Other continuing work includes a Vici project (Prof. Dr H. Bekkering), four Veni projects (Dr S. Ruscheneijer, Dr K. Lemhöfer, Dr E. de Brujin and Dr L. Selen), a Vidi project coordinated by Prof. R. Kessels and several open competition projects funded by the NWO, as well as the 'visiting' Marie Curie grant awarded to Dr J. Loehr (mentor: Prof. G. Knöblich). The establishment of a chair for contextual neuropsychology (Prof. J. Eggers) - in collaboration with the Vincent van Gogh Institute for Psychiatry - will further enhance research within the DCC.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognitive Neuroimaging

The mission of the Donders Centre for Cognitive Neuroimaging (DCCN) is to conduct basic and applied research in cognitive neuroscience. Much of the recent rapid progress in this field is driven by the development of complex neuro-imaging techniques for the *in-vivo* scanning of activity in the human brain – an area in which the DCCN plays a leading role.



Research at the DCCN relates to complex central cognitive functions. The aim is to unravel these functions and understand how they are represented in the brain. This is done by identifying the networks of brain areas that are vital to each of the functions and determining the role of – and interactions – between brain regions. In order to achieve this, it is necessary to understand how neurons make networks and how networks carry out cognitive functions – in other words, how to get from neurons to cognition. The Centre also aims to establish how the different brain areas are able to coordinate their activity with such temporal accuracy that this enables both human and animal cognition.

Another important aspect of the research is improving the imaging methods themselves, by optimally combining imaging techniques with high spatial (fMRI) and high temporal (MEG, TMS and EEG) resolution (*i.e.* multimodal imaging). In addition, advanced data analysis tools are developed to extract the relevant information from the highly complex signals which these imaging systems provide. In recent years, some aspects of both the cognitive and the methodological research have been combined in projects within the theme brain-computer interface, for which both a deep understanding of brain functioning and technical excellence are required.

All of the research at DCCN, which is organized in groups led by Principal Investigators at the Donders Institute for Brain, Cognition and Behaviour, is embedded in one of the following four major research themes.

### *Language and Communication*

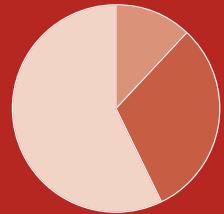
Resting-state fMRI provides a window onto the functional connectivity of the brain. In an advanced experiment the functional connectivity within the perisylvian language network was investigated by seeding from three sub-regions of Broca's complex and their right-hemisphere homologues. A clear topographical functional connectivity pattern was revealed in the left but not in the right hemisphere. Areas with known sensitivity to phonological, syntactic and semantic information in the left frontal, parietal, and temporal areas were most strongly connected. This is the first demonstration that a functional connectivity topology can be observed in the perisylvian language network. This finding supports the assumption that there is a functional network division for phonology, syntax, and semantics in Broca's complex, as proposed by the Memory, Unification, and Control (MUC) model.

An fMRI repetition suppression paradigm in speech comprehension and production was used to investigate at what levels speaking and



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 Prof. G. Fernández (o)  
 Prof. P. Hagoort (o)  
 Prof. D.G. Norris (o)  
 Prof. D.J. Ruiter (o)



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

### Tenured

Full Professors	3.9 FTE
Associate Professors	2.0 FTE
Researchers	6.0 FTE

### Non-tenured

Researchers	25.1 FTE
Doctoral candidates	48.2 FTE

listening overlap in the brain. Results showed that the brain areas involved in semantic, lexical, and syntactic processing are mostly the same for speaking and listening. The effects of motor processes overlap in the auditory cortex, and in the left inferior frontal cortex, but not in the motor cortex. These results indicate that the core components of the language system are used for both speaking and listening. However, the motor system does not provide a crucial contribution to listening.

The Principal Investigator for this theme is Prof. P. Hagoort.

### *Perception, Action and Control*

Five research groups at DCCN work within the Perception, Action and Control theme. These groups study how perceptual and conceptual information can structure action plans and the brain circuitry that makes human action possible. This line of research has recently provided new insights into a long-standing mystery, namely why patients with basal ganglia alterations (Parkinson's disease) develop tremors, even though this symptom is produced by an entirely different cerebral circuit. It turns out that transient alterations in basal ganglia activity drive a second circuit, which operates outside its physiological range, causing the tremors.

One key issue is how perception and cognition is shaped by prediction and how this process interacts with attention. Research has focused on contrasting several stages in which expectation might influence perceptual inference. A series of fMRI studies, in which spatial and featural predictability were manipulated, indicate that predictability modulates activity in early sensory areas, independently of attention.

How is visual information represented in the brain, and how are such representations adjusted to better serve behavioural demands? Research has focused on these and other questions regarding the neural basis of visual perception. Results have shown that top-down processes, such as attention, selectively enhance the neural representation of task-relevant visual features, but not the irrelevant features, of an attended object.

The mechanisms of individual and interactive decision-making are investigated by combining methods from various behavioural experiments, functional neuroimaging, and economic models. Research has focused on the cognitive and neural systems that underlie social decision-making. The group has studied the degree to which affective factors such as trust and feelings of fairness can alter our interactive choices and judgments, in contrast to 'rational'

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognitive Neuroimaging

Dr Tineke Snijders' dissertation (*cum laude*) 'More than words. Neural and genetic dynamics of syntactic unification' was based on experiments using an fMRI scanner. She used this instrument to analyze people's brains while they were reading. See picture p. 66-67.



models of behaviour, while also constructing biologically-based models of guilt and empathy. Results have demonstrated that prior knowledge about what is typical in a social exchange can radically change our decisions, even in the face of learning that these expectations are not valid, and also identified the potential neural systems underlying both expectations and social emotions.

Investigations of the psychopharmacological mechanisms of the motivational and cognitive control of decision making are made. This work focuses on the role of fronto-striatal circuitry and its neuromodulation by dopamine and serotonin in health and disease, with the ultimate translational aim of understanding the neurochemical mechanisms underlying a variety of neurological and neuropsychiatric disorders. The group has been successful in setting up pharmacological fMRI protocols to study the role of dopamine and serotonin in healthy volunteers, patients with Parkinson's disease, patients with ADHD and people suffering from psychopathological conditions. Results demonstrate the critical role of dopamine and serotonin in motivation as well as value-based decision making and are beginning to shed light on the neural mechanisms of action.

The Principal Investigators working on this theme are Dr I. Toni, Dr F. de Lange, Dr J. Jehee, Dr A. Sanfey and Dr R. Cools.

### *Learning, Memory and Plasticity*

Two research groups at DCCN work on the Learning, Memory and Neuro-plasticity. One research line explores how the brain maps space and forms memories. By combining fMRI with virtual reality techniques grid-cell like representations of space have been discovered in the human brain. These representations, which support spatial memory, are found in a circuit of regions which markedly overlap with the network for autobiographical memory. This group has also demonstrated the potential of fMRI for inferring the fine-scale properties of neural systems in humans by building

on animal models. Another research line focuses on the neural underpinnings of memory, emotion and their interactions. A series of fMRI studies explored how psychological stress affects cognitive and affective processing. The results revealed that stress modulates several processes in a carefully orchestrated and highly adaptive way, thus improving survival under adverse conditions. In addition, breakthroughs were made while studying the fundamental processes of long-term memory consolidation.

The Principal Investigators for this theme are Prof. G. Fernández and Dr C. Döller.

### *Brain, Networks and Neuronal Communication*

Four research groups at DCCN contribute to the Brain, Networks and Neuronal Communication theme. They study how neuronal oscillations shape the functional architecture of the working brain. This is done in the context of cognitive tasks. Data are acquired from animals and humans using intracranial recordings, EEG and MEG and analyzed. Numerous MEG studies at the DCCN suggest that oscillatory activity plays an important role in shaping the functional architecture of the brain: for instance, activity in the gamma band reflects neuronal processing. The underlying neuronal synchronization is involved in communicating representational information between brain areas. For example, alpha band activity reflects the disengagement of task-irrelevant areas. This disengagement serves to direct the information flow through the brain. Characterization of cross-frequency interactions reveals how the brain functions as a network in memory, attention and perception tasks.

The MR techniques group, which specializes in brain function, conducts research designed to improve the ability to measure brain function and structure with magnetic resonance techniques, which are used to evaluate the connectivity between brain regions. To achieve these goals it improves existing methodologies and

develops novel techniques for the acquisition of fMRI data – both in activation studies and in the resting state – as well as diffusion tensor imaging, proton spectroscopy and measures of brain connectivity.

The Statistical Imaging Neuroscience group develops unified analytical approaches for analysing neuroimaging data in order to develop powerful multimodal *research* tools for imaging neuroscientists and advanced *practical* tools for clinicians. These tools are used for investigations into cognition, in clinical settings (for diagnosing conditions such as dementias, MS, addiction and oncology) as well as in other challenging imaging scenarios, such as pharmacological studies or early brain development in neonates. The Principal Investigators working on this theme are Dr O. Jensen, Prof. D. Norris and Dr C. Beckmann.

### Awards and acknowledgements

- Dr O. Jensen received a Vici grant
- Dr G. Van Wingen and Dr A. Mazaheri received a Veni grant
- Dr C. Döller received an ERC Starting Grant and the Sofja Kovalevskaja Award
- Together with Prof. R. Morris (University of Edinburgh) Prof. G. Fernández received an ERC Advanced Investigator Grant
- Prof. G. Fernández, Dr I. Toni and Dr F. De Lange received an NWO Brain & Cognition Grant
- Prof. P. Hagoort was portrayed in a 45-minute documentary on Dutch national TV in a series about seven top scientists in the Netherlands and was elected one of the 124 members of the International Neuropsychological Symposium.

### Research facilities

- three MR scanners – dedicated to research at 1.5, 3, and 7 Tesla – for measuring structural anatomy and functional brain activity with high spatial resolution
- a whole-head, 275-channel MEG system, for measuring neuronal activity with high temporal and good spatial resolution
- two EEG laboratories, with 128 channel recording possibilities, for measuring the synchronous electrical activity of large ensembles of neurons
- a dedicated 64-channel EEG system for measuring EEG in the MR scanners
- two behavioural laboratories
- integrated stimulus presentation facilities for auditory and visual presentation as well as activities such as somatosensory stimulation
- dedicated eye-tracking facilities suitable for fMRI, MEG and behavioural experiments
- a computer infrastructure with centralized storage management and central computation power
- a facility for awake monkey neurophysiology, allowing simultaneous recording from 256 sites across the brain
- a laboratory for TMS.

### Collaboration

The DCCN is a research centre at Radboud University Nijmegen in which the universities of Maastricht, and Twente as well as the Radboud University Medical Centre and the Max Planck Institute for Psycholinguistics in Nijmegen also participate.

The DCCN collaborates with the University of Duisburg-Essen in Germany – a preferred partner of Radboud University Nijmegen – on the operation of a joint research centre for high-field MR imaging in Essen.

The DCCN is also engaged in structural collaboration with many other academic institutions, including:

- University of Kiel, Germany (arterial spin labelling techniques)
- Columbia University, New York, USA (TMS, perceptual awareness)
- Unicog U562, Gif/Yvette, France (evidence accumulation)
- University College London, UK (place cell plasticity)
- University of Edinburgh, UK (memory consolidation)
- University of Arizona, Tucson, USA (decision neuroscience)
- University of Trento, Italy (decision neuroscience)
- Chinese Academy of Sciences, Beijing, China (neurocognition of language)
- Cornell University, New York, USA (neurocognition of language)
- Imperial College London, UK (MRI analysis tools)
- Heinrich-Heine-Universität, Düsseldorf, Germany (multilingualism)
- Ernst-Strüngmann-Institute, Frankfurt, Germany (neuronal coherence)
- University of California, Berkeley, USA (dopamine and working memory).

### Societal impact

The DCCN contributes to a better understanding of the nervous system by disseminating its expertise and knowledge to both the scientific community and the general public. An annual series of courses entitled 'The cognitive neuroscience tool-kit' attracts students and researchers from all over Europe. An advanced analysis software package used to analyse MEG and EEG data has been developed and made available to the neuroscience community.

Staff at the DCCN gave numerous lectures for the general public, including 'How does the brain see?' at the MUZieUM in Nijmegen and 'Out-of-body experience' at De Brakke Grond in Amsterdam. Prof. G. Fernandez received the Radboud Science Prize, which enabled him to set up a programme in which he taught contemporary science topics to elementary school pupils. An interview with Prof. G. Fernandez formed the basis for an article in the science section of the Christmas edition of the NRC Handelsblad. During the year researchers at the DCCN appeared in various TV shows, including (twice) contributions to the programme 'Pavlov - Waarom ben ik zo?' in which the alleged talents of celebrities are investigated.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Cognitive Neuroimaging

### Key publications

Cools, R., Miyakawa, A., Sheridan, M. & D'Esposito, M. (2010). Enhanced frontal function in Parkinson's disease. *Brain*, 133(Pt 1), 225-233.

Cousijn, H., Rijkema, M., Qin, S., Marle, H.J.F. van, Franke, B., Hermans, E.J., Wingen, G. van & Fernández, G. (2010). Acute stress modulates genotype effects on amygdala processing in humans. *Proceedings of the National Academy of Science of the USA*, 107, 9867-9872.

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Döller, C., Barry, C. & Burgess, N. (2010). Evidence for grid cells in a human memory network. *Nature*, 463, 657-661.

Gerven, M.A.J. van, Cseke, B., Lange, F.P. de & Heskes, T. (2010). Efficient Bayesian multivariate fMRI analysis using a sparsifying spatio-temporal prior. *Neuroimage*, 50(1), 150-161.

Haegens, S., Osipova, D., Oostenveld, R. & Jensen, O. (2010). Somatosensory working memory performance depends on both engagement and disengagement of regions in a distributed network. *Human Brain Mapping*, 31, 26-35.

Janzen, G. & Jansen, C. (2010). A neural wayfinding mechanism adjusts for ambiguous landmark information. *Neuroimage*, 52(1), 364-370.

Kesteren, M.T. van, Fernández, G., Norris, D.G. & Hermans, E.J. (2010). Persistent schema-dependent hippocampal-neocortical connectivity during memory encoding and post-encoding rest in humans. *Proceedings of the National Academy of Sciences USA*, 107, 7550-7555.

Koopmans, P.J., Barth, M. & Norris, D.G. (2010). Layer specific BOLD activation in human V1. *Human Brain Mapping*, 31, 1297-1304.

Lange, F.P. de, Jensen, O. & Dehaene, S. (2010). Accumulation of evidence during sequential decision making: the importance of top-down factors. *Journal of Neuroscience*, 30, 731-738.

Noordzij, M.L., Newman-Norlund, S., Newman-Norlund, R., Ruiter, J.P. de, Hagoort, P., Levinson, S.C. & Toni, I. (2010). Neural correlates of intentional communication. *Frontiers in Neuroscience*, 4, 1-7.

Schouwenburg, M. van, Ouden, H. den & Cools, R. (2010). The human basal ganglia modulate frontal-posterior connectivity during attention shifting. *Journal of Neuroscience*, 30, 9910-9918.

Vinck, M., Lima, B., Womelsdorf, T., Oostenveld, R., Singer, W., Neuenschwander, S. & Fries, P. (2010). Gamma-phase shifting in awake monkey visual cortex. *Journal of Neuroscience*, 30(4), 1250-1257.

Willems, R.M., Boer, M. de, Ruiter, J.P. de, Noordzij, M.L., Hagoort, P. & Toni, I. (2010). A dissociation between linguistic and communicative abilities in the human brain. *Psychological Science*, 21, 8-14.

Womelsdorf, T., Johnston, K., Vinck, M. & Everling, S. (2010). Theta-activity in anterior cingulate cortex predicts task rules and their adjustments following errors. *Proceedings of the National Academy of Sciences of the United States of America*, 107(11), 5248-5253.

Xiang, H., Fonteijn, H.M., Norris, D.G. & Hagoort, P. (2010). Topographical functional connectivity pattern in the Perisylvian language networks. *Cerebral Cortex*, 20, 549-560.

Dissertations:	10
Scientific publications:	123
Professional publications:	1

### Future research

#### Language and Communication

Future work will focus on various aspects of language production, bilingualism and structural as well as related functional changes. Moreover, language behaviour will be studied in conversational setting in a Virtual Reality environment.

#### Perception, Action and Control

Current work – along two main lines of research, targeting instrumental and communicative actions – will be continued. Experiments are planned to study the mechanisms that integrate visuospatial and perceptual information into a motor plan, as well as the cerebral and computational mechanisms that support the generation of human communicative actions.

## Director: Prof. Peter Hagoort

Prof. Hagoort was the founding director of the Donders Institute's Centre for Cognitive Neuroimaging (DCCN). In 2006 he was appointed director of the Max Plank Institute (MPI) in Nijmegen, where he headed the department on the Neurobiology of Language. Peter Hagoort is Professor of Cognitive Neuroscience at Radboud University Nijmegen. Prof. Hagoort has been a visiting scholar at Cambridge University (UK) and Stanford University in California (USA) and is a member of many international scientific boards and councils. The KNAW awarded him with Hendrik Muller Prijs in 2003. In 2006 he received the Spinoza Prize from the NWO. Peter Hagoort is an elected member of the KNAW.



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Assessments will be extended to other clinical (neuropsychiatric) populations, including pathological gambling and borderline personality disorder.

Future work is designed to characterize the role of predictive suppression and the interplay between sensory and decision-related areas during perception, using multivariate classification in fMRI. In MEG experiments we aim to temporally dissociate the effects of predictability and attention during perceptual decisions. The group will investigate how visual information is represented in the brain and how visual representations are adjusted to better serve behavioural demands. The approach will be to address these and other questions using both theoretical modelling and experimental approaches, including functional brain imaging, neural decoding techniques and visual psychophysics.

Future studies will extend the themes of social interactive decision-making, by investigating how prior expectations are formed, to what degree they are malleable via experience, what individual differences may underlie responses to fairness and trust, and whether these can be affected by pharmacological manipulations. Explorations of the neuroscience of individual decision-making will begin, in particular the neural and behavioural response to uncertainty and risk in decision-making.

*Research within the Learning, Memory and Plasticity theme*  
The effects of stress and steroid hormones on specific brain operations that underlie mood regulation, stress perception and memory will be studied. An attempt will be made to identify a mechanistic account of the effects of stress on memory and

mental health, incorporating three dimensions in a fully integrated approach: pharmacology, genetics and neural processes.

Proxy measures of grid-cell like activity recently described by the group are used to understand the specific neural mechanisms of memory formation, memory reactivation and general human cognition. This approach could potentially produce a coherent understanding of brain function from neural representations to system level involvement in behaviour.

*Brain, Networks and Neuronal Communication*  
Cognitive tasks involving newly developed cross-frequency analysis techniques will be used to investigate the way the brain functions have a network. This will be done using a multimodal approach combining EEG with TMS and fMRI. Brain-computer interfaces will permit online investigation of the role of oscillatory brain states in perception and memory.

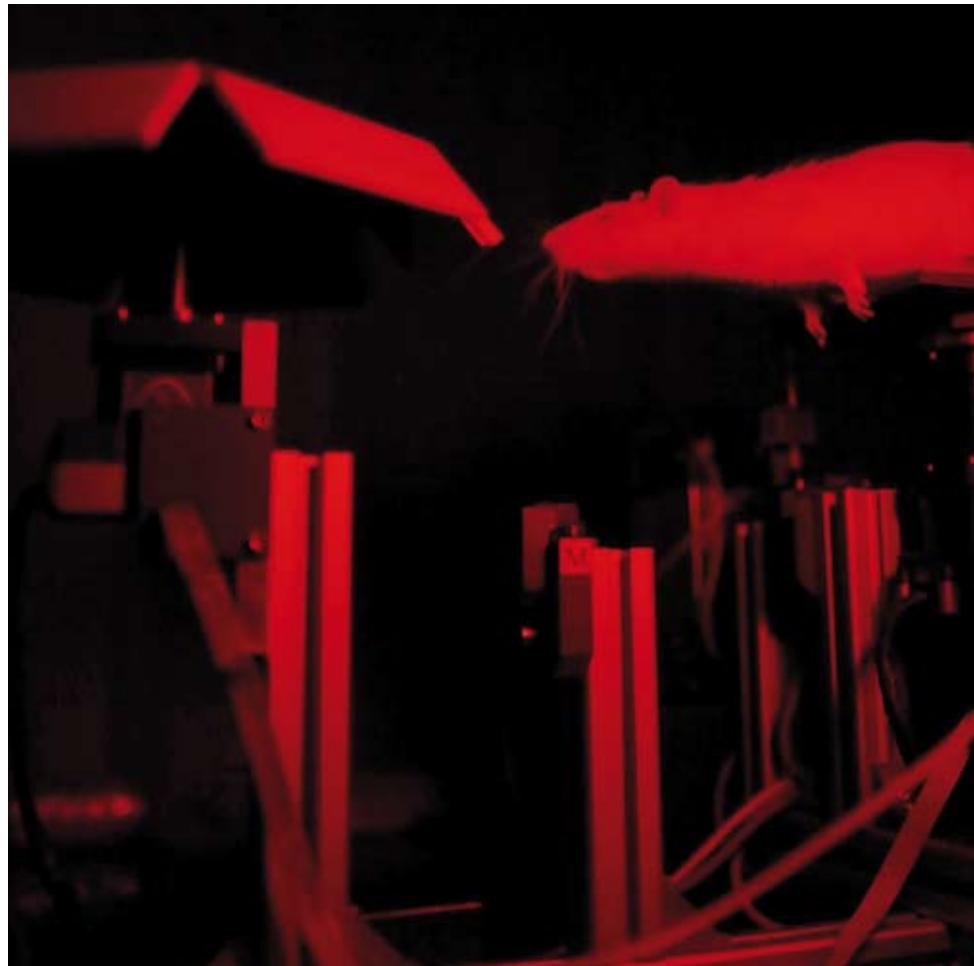
Laminar fMRI will be developed as a routine fMRI application. Resting state fMRI data will be acquired at 7T and analysed to explore directional connectivity, whereas the use of proton spectroscopy to measure inhibitory brain activity will be established at both 3T and 7T.

A new methodology will be developed for analysing multi-subject data with respect to functional and structural brain connectivity in health and disease. This work will address the issue of the stationarity of functional connectivity patterns in order to gain a deeper understanding that will improve the cross-modal integration of electrophysiological measurements.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Neuroscience

The human brain is a dynamic, self-organizing system, whose potential for adaptation – which is rooted in its genetic profile – is expressed through interaction with the environment. At the Donders Centre for Neuroscience (DCN), research on both animals and humans takes place at the level of genes, molecules, neurons, networks of neurons and the whole organism.



The DCN brings together inter-disciplinary basic and clinical research groups from the Faculty of Science and the Radboud University Nijmegen Medical Centre. The strength of the centre lies in the way it combines a broad repertoire of skills, experimental facilities and expertise from the molecular level to the behavioural level in basic and clinically applied research on cognitive neuroscience. Exploiting this interdisciplinary expertise, the DCN aims to provide mechanistic accounts of diverse cognitive and affective domains such as attention, memory, and anxiety with a special focus on their genetic underpinnings. This knowledge is used to unravel vulnerability to and pathophysiology of neuropsychiatric disorders such as Alzheimer's disease, stroke, depression and attention deficit disorder. Ultimately this research will not only provide fundamentally new insights into how the brain works – it will also lead to new diagnostic and therapeutic approaches. Besides doing research, scientists at the DCN use their expertise and skills to train students, researchers and physicians who are active in the field of neuroscience as well.

### Awards and acknowledgements

- Prof. Stan Gielen was elected as a member of the Royal Netherlands Academy of Arts and Sciences (KNAW).
- Prof. Guillén Fernández was awarded an ERC Advanced Investigator Grant (PI together with Richard Morris, University of Edinburgh) entitled: 'The neurobiology of schemas: knowledge acquisition and consolidation'. He received four NWO (Netherlands Organisation for Scientific Research) grants – two of them in collaboration with Prof. Ludo Verhoeven of the Behavioural Science Institute (BSI) – and he received the Radboud Science Award.
- Dr Nael Nadif Kasri was awarded an UMC tenure track fellowship for a project entitled 'Mental Retardation: harnessing the synaptic dysfunction hypothesis'.
- Dr Tamás Kozics and Dr Judith Homberg received an NWO-ALW grant for their research on understanding nature-nurture interaction in the psychobiology of depression.
- Prof. Gerard Martens acquired a TI Pharma grant for 'Novel susceptibility pathways and drug targets for psychosis'.



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 Prof. A.F.M. Snik (e)  
 Prof. D.F. Stegeman (p)

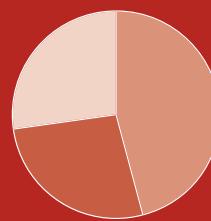
Prof. P.H.E. Tiesinga (o)  
 Prof. R.A. Wevers (o)  
 Prof. M.J. Zwarts (o)

### Tenured

Full Professors	10.1 FTE
Associate Professors	7.4 FTE
Assistant Professors	17.3 FTE
Researchers	15.5 FTE

### Non-tenured

Researchers	48.4 FTE
Doctoral candidates	96.5 FTE



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

- Prof. Hans van Bokhoven and Dr Annette Schenck acquired a large grant as part of an EU FP7- integrated project on genetic and epigenetic networks in cognitive dysfunction.
- Prof. Jan Buitelaar received an NWO Brain & Cognition Grant on the neural architecture of cognition in relation to its genetic architecture – in collaboration with Dr Barbara Franke and Prof. Bert Kappen – and a ZonMw grant with Prof. Rutger Engels (BSI). Furthermore, Jan Buitelaar participated sucessfully in three FP7 projects.
- Prof. Bas Bloem received grants from 1) the Stichting Internationaal Parkinson Fonds in collaboration with Dr Rianne Esselink; 2) het innovatiefonds zorgverzekeraars with Dr Marten Munneke; 3) Royal Dutch Society for Physical Therapy with Dr Marten Munneke and Dr Samyra Keus; 4) the Princess Beatrix Foundation with Dr Bart van de Warrenburg and Dr Marina de Koning-Tijssen; 5) the Parkinson Foundation with Dr Bart Post; 6) ZonMW/NWO with Dr RRob de Bie, AMC); 7) Glaxo-Smith-Kline with Dr Marten Munneke; 8) Zorgverzekeraars Nederland; 9) Medtronic; 10) Hilde-Ulrichs-Stiftung für Parkinsonforschung.

- Dr Barbara Franke, Dr Annette Schenk, Prof. Jan Buitelaar, and Prof. David Norris were awarded an NWO project grant in the Brain and Cognition programme on genetic pathways in ADHD.
- Dr Judith Homberg was awarded with a ZonMW grant to study the role of serotonin in cocaine addiction and received an NWO Brain & Cognition grant together with Dr Dirk Schubert for a project entitled 'What antidepressant manuals do not tell: tampering with serotonin during development'. In collaboration with Dr Jo Zhou and Prof. Hans van Bokhoven she was awarded a DCN project grant to study the epigenetics of the age-dependent effects of Prozac.
- Dr Nael Nadif Kasri and Dr Armaz Aschrafi each received an FP7 Marie Curie reintegration grant.
- Dr Marcel Olde Rikkert received an NWO grant for a project on Brain Ageing.
- Dr Marcel Verbeek received a grant fom the American Alzheimer Association for work on ApoE and ApoJ in the cerebrovascular clearance of amyloid beta protein in cooperation with Dr Rob de Waal.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Neuroscience



Dr Judith Homberg (Assistant Professor) received an NWO Vidi grant. She specializes in research on epigenetic mechanisms that have negative effects (such as depression and addiction) or positive ones (e.g. learning) due to interactions between genes and the environment.



- Dr Rochan Cools received an Open Competition research grant from NWO (MaGW) in collaboration with Dr Ole Jensen.
- Prof. John Van Opstal received a KNAW Visiting Professor grant (for Prof. Martha Flanders). Together with Dr Martijn Agterberg and Prof. Ad Snik he received an Oticon Grant (Denmark) and a research grant from Vibrant Med-El, Switzerland.
- Prof. Bert Kappen acquired two grants on Multi-agent systems – one as part of an EU FP7 project and the other from the Thales group.
- Dr Douwe Bergsma and Prof. Albert van den Berg received a research grant from Nuts Ohra and one from the Stichting Blindenhulp.
- Dr Sigrid Pillen received the Young Investigator's Prize from the Dutch Society for Paediatrics.
- Prof. Baziel van Engelen received several grants from the Princess Beatrix Foundation, the Reuma Foundation and the Association Francaise contre les Myopathies.
- Dr John Heesakkers received two research grants: from the Continence Foundation and Astellas Pharma for a proposal investigate the urinary markers of neurotransmitters and from Uroplasty Inc. to study fMRI in patients with micturition disorders.
- A Devon Foundation grant on 'Errorless learning' was awarded to Prof. Roy Kessels.
- Dr Judith Homberg received a Vidi grant from NWO for her project 'Gene-environment interactions: for better and for worse'.
- Dr Sebastiaan Overeem, received a Vidi grant for 'Powernaps in Parkinson's disease'.
- Dr Vivian Weerdesteyn received a Veni grant from NWO for a project entitled 'Understanding the fall risks and mechanisms in patients after stroke'.

### Research facilities

On 22 January 2010 The Radboud Fall Simulator at the Department of Rehabilitation was officially opened for scientific research (it was built with a 'middelgroot' grant from NWO).

### Collaboration

#### *Local*

Besides collaboration within the Donders Institute, researchers at the DCN cooperate with several other research institutes on campus, including IGMD, NCEBP, NCMLS, IMM and ICIS.

#### *National*

Researchers at the DCN collaborate with colleagues at virtually all Dutch universities.

#### *International*

- Max Planck Institutes in Berlin, Dresden, Göttingen, Munich & Tuebingen, Germany
- Zentralinstitut für Seelische Gesundheit, Mannheim, Germany
- Technical University Berlin, Germany
- Ruprecht Karl University, Heidelberg, Germany
- INSERM, University of Tours, Nice & Institut Cochin, France
- Univ. Paris Descartes, Paris, France
- University of Madrid, Spain
- Center for Sensory Motor Interaction Aalborg, Denmark
- Karolinska Institute Stockholm, Sweden
- Oxford University, Oxford, UK.
- University College London, UK
- Medical Research Centre, Cambridge, UK
- University of Edinburgh, UK
- Weizmann Institute of Science, Rehovot, Israel
- University of California, Berkeley, USA
- Salk Institute, La Jolla, USA
- Yale University Medical School, New Haven, USA
- Cold Spring Harbor Laboratories, New York, USA
- Massachusetts General Hospital and Harvard Medical School, Boston, USA
- University of Toronto, Ontario, Canada.

#### Companies:

- Synome, Cambridge, UK.
- Aktogen Ltd., University of Cambridge, UK.
- BAC, Naarden, the Netherlands
- Cyclotron BV, Amsterdam
- MSD, Oss
- Philips, Eindhoven
- Virtual Proteins, Eindhoven.

#### Patient organizations:

- EGAN, Patients Network for Medical Research and Health

#### *Preferred partners of Radboud University Nijmegen*

- Catholic University of Leuven, Belgium
- Universitat de Barcelona, Spain
- Università degli Studi di Siena, Italy
- Universität Duisburg-Essen, Essen, Germany
- University of Münster, Germany
- University of North Carolina at Chapel Hill, Chapel Hill, USA.

## Results

### *Perception, Action and Control*

#### *Multisensory integration in complex environments*

Prof. John van Opstal and Dr Mark van Wanrooij have developed and successfully tested a double-magnetic induction method to record head-free gaze shifts in trained monkeys. This method allows for an unprecedented series of electrophysiological studies of eye-head coordination, sound localization and multisensory integration in primates. Their experiments have demonstrated the existence of an optimal strategy of sensorimotor integration within the neural population of cells involved in gaze control.

#### *Visual field restoration in hemianopes*

Dr Douwe Bergsma and Prof. Bert van den Berg investigated central visual field recovery and demonstrated that people suffering from hemianopes (partial loss of the visual field) following stroke can recover part of their blind field through visual training. Recovery varied from very slight (< 1 degree) to considerable (10-20 degrees). The degree of functional gain (e.g. for reading and driving in a driving simulator) depends on the eccentricity of the blind field.

#### *Striatum involved in cognitive function*

Dr Rochan Cools and her group developed pharmacological fMRI protocols to study the role of dopamine and serotonin in healthy volunteers, patients with Parkinson's disease, patients with ADHD and people with a psychopathic condition. Results demonstrate the critical role of dopamine and serotonin in motivation and value-based decision making and are beginning to elucidate the neurochemical mechanisms underlying impulsivity and compulsivity. An example of a striking finding is the fact that the striatum appears

to regulate attentional shifting by altering connectivity between the prefrontal cortex and posterior regions of the brain. This highlights an important contribution of the striatum, which is traditionally primarily associated with motor control and/or reward, to cognitive function and shows that this contribution might be mediated by factors influencing the prefrontal cortex.

### *Learning, Memory and Plasticity*

#### *Neurite outgrowth pathways are over-represented in genetic findings in dyslexia and ADHD*

Profs Franke, Buitelaar and Poelmans developed an integrated theoretical network of genes and proteins involved in dyslexia. They found that 10 of the 14 dyslexia candidate genes fitted into a theoretical molecular network involved in neuronal migration (dyslexia) and neurite outgrowth (dyslexia and ADHD). Based on this finding, they further proposed three novel dyslexia candidate genes from known linkage regions. This model is an important step towards integrating the vast number of signals from various sources to gain a better understanding of the molecular basis of dyslexia.

### *Developmental control of brain arealization*

Dr Sharon Kolk and Prof. Gerard Martens and their team discovered molecular determinants involved in the development of the cortex and in the formation of dopaminergic projections to target areas in the cortex. Furthermore, they showed that during development serotonin fibers make synaptic contacts with reelin cells that are involved in the formation of layers in the prefrontal cortex. Since layer formation in the prefrontal cortex seems to be disturbed in a number of neurodevelopmental disorders, including schizophrenia and autism, these results may help to understand the aetiology of neurodevelopmental disorders and contribute to future gene therapy strategies based on the factors identified.

### *The genetics of movement disorder*

Dr Bart van den Warrenburg found a new genetic risk factor for both Parkinson's disease and amyotrophic lateral sclerosis, suggesting that neurodegenerative diseases share certain disease mechanisms.

### *Effects of psychological stress on cognition*

Fernández and his group performed a set of novel fMRI studies to explore how psychological stress affects cognitive and affective processing. Results revealed that stress modulates several processes in a carefully orchestrated and highly adaptive way improving survival under adverse conditions. In addition, his team made several breakthroughs while studying fundamental processes of long-term memory consolidation.

### *Edinger-Westphal nucleus involved in stress*

Dr Tamasz Kozicz and Prof. Eric Roubos showed that acute pain influences mood and physiology via the Edinger-Westphal nucleus (EW) rather than the hypothalamic paraventricular nucleus.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Neuroscience

### Key publications

Anitei, M., Stange, C., Parshina, I., Baust, T., Schenck, A., Raposo, G., Kirchhausen, T. & Hoflack, B. (2010). Protein complexes containing CYFIP/Sra/PIR121 coordinate Arf1 and Rac1 signalling during clathrin-AP-1-coated carrier biogenesis at the TGN. *Nature Cell Biology*, 12(4), 330-40.

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Gómez, V., Kappen, H.J. & Chertkov, M. (2010). Approximate inference on planar graphs using loop calculus and belief propagation. *Journal of Machine Learning Research*, 11, 1273-1296.

Homberg, J.R., Schubert, D. & Gaspar, P. (2010). New perspectives on the neurodevelopmental effects of SSRIs. *Trends in Pharmacological Sciences*, 31(2), 60-65.

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Schouwenburg, M.R. van, Ouden, H.E. den & Cools, R. (2010). The human basal ganglia modulate frontal-posterior connectivity during attention shifting. *Journal of Neuroscience*, 30(29), 9910-8.

Snijders, A.H. & Bloem, B.R. (2010). Images in clinical medicine. Cycling for freezing of gait. *New England Journal of Medicine*, 362(13), e46.

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Xu, L., Bloem, B.R., Gaszner, B., Roubos, E.W. & Kozicz, L.T. (2010). Stress-related changes in the activity of cocaine- and amphetamine-regulated transcript and nesfatin neurons in the midbrain non-preganglionic Edinger-Westphal nucleus in the rat. *Neuroscience*, 170(2), 478-488.

Dissertations: 34  
Scientific publications: 595

The obesity factor leptin also acts on the EW, probably to achieve a balance between metabolic reserves and stress responses.

#### **New diagnostic tools for Alzheimer's disease**

Prof. Marcel Olde Rikkert showed that cerebrospinal fluid data collected over a 36-hour allows diagnosis of intra-individual variability in biomarkers for Alzheimer. Furthermore, transcranial Doppler sonography and near-infrared spectroscopy (NIRS) measurements in Alzheimer patients have been validated as tools for measuring brain perfusion and assessing the effects of drugs.

#### **Assessment of memory function**

Prof. Roy Kessels developed and evaluated a new instrument for assessing implicit memory function in clinical practice, demonstrating intact learning, even in severe dementia patients. He also developed and evaluated treatments programmes for patients with mild cognitive impairments and dementia patients, using intact implicit memory through errorless learning.

#### **Alzheimer therapy in mouse model**

Dr Marcel Verbeek and his team identified the application of sulfated glycosaminoglycans as a potential therapeutic option for Alzheimer's disease by studying transgenic mice models. At the same time the group also gathered important experimental data showing the limitations of many of the transgenic mouse models that have been developed for Alzheimer's disease.

#### **Brain Networks and Neuronal Communication**

Nonlinear dendrites support oscillations in hippocampal networks Dr Raoul-Martin Memmesheimer developed a model to account for the fast oscillations in the hippocampus, which are called sharp-wave ripples. The key insight of this model is that dendritic non-linearities make the neurons more sensitive to synchronous inputs, which helps them participate in the oscillation. These findings could have major implications for the mechanism by which memories are stored.

#### **Computational model predicts phase shifts in neuronal network oscillations**

The principle of communication through coherence holds that synchronous oscillations may underlie selective communication between brain areas and, as such, may be fundamental to the process of selective attention, but it can only function if there is a way to alter the phase of oscillations. Prof. Paul Tiesinga developed computational models utilizing either an interneuron gamma (ING) or pyramidal interneuron gamma (PING) architecture to study the under conditions under which coupled networks of neurons can support phase shifting. Excitatory pulses to inhibitory neurons yield phase shifts for both ING and PING networks, but pulses to excitatory neurons are only effective in PING networks. Using these insights an experimental test for fundamental mechanisms of selective attention can be designed using new optogenetic techniques.

# Donders Institute for Brain, Cognition and Behaviour

## Centre for Neuroscience

### *Promedas and Bonaparte: computational neuroscience in society*

Prof. Bert Kappen and colleagues built Promedas (PRObabilistic MEdical Diagnostic Advisory System), the world's most complete medical diagnostic advisory system (with UMC Utrecht and Promedas BV) and Bonaparte, unique software designed to match the DNA of missing persons (with the Dutch Forensic Institute).

### *Better Brain Computer Interface performance by 'surprise'*

In the Braingain project, the Kappen group developed an adaptive Brain Computer Interface (BCI). The output of the BCI provides a surprise response in the subject when it disagrees with the subjects intention. This surprise is measurable as a so-called error potential. The group demonstrated that this signal can be used to improve the performance of the BCI.

### **Societal impact**

#### *Media appearances*

- Prof. Marcel Olde Rikkert appeared on national radio (NCRV Casa Luna) to talk about working after retirement.
- Prof. John van Opstal's work on sound localization and plasticity was reported on in the NRC (national quality newspaper) and he gave a Radio interview about it on Radio 1.
- Dr Wim Wiegerinck, Dr Willem Burgers and Prof. Bert Kappen were referred to in numerous newspaper articles and on NOS News because of their new Bonaparte software for Victim Identification based on DNA, which was released in April 2010.
- Prof. Hans van Bokhoven appeared frequently in local, regional and national newspapers (Gelderlander, NRC handelsblad, de Standaard) and in radio interviews.
- Dr Judith Homberg was interviewed by the magazines Science News and Psychologie.
- Dr Hans van Dijk en Prof. Bernd Lapatki – with several other Donders Institute researchers – took part in the TV programme 'Pavlov'; they were also interviewed by the NTR for the radio programme 'Hoe? Zo!'.
- Prof. Bas Bloem frequently appeared in the media. The highlight was an article on a patient who was grounded by severe freezing of gait, but was still perfectly able to ride a bicycle. This item made it to the front page of the New York Times and from there onto many TV and radio programmes worldwide. He appeared in interviews all over the world (for National Parkinson Foundation, on Business News Radio, BBC World, Canadian, Australian and German national radio) and numerous articles were published on this subject.
- Dr Sebatiaan Overeem appeared on BNR radio to talk about his research on Parkinson and powernaps.
- Dr Marcel Verbeek was interviewed by 'Reformatorisch Dagblad' to discuss his the research on Tyrosine Hydroxylase Deficiency syndrome.
- Dr Rochan Cools frequently appeared in the media, including in national magazines (e.g. the December issue of Elsevier and Viva), and on national television (e.g. in the VARA programme Nieuwslicht).

### **Director: Prof. Paul Tiesinga**

Paul Tiesinga has been a full professor of Neuroinformatics at the Faculty of Science since 2009. He is an expert in constructing models of the visual cortex, which he uses to study mechanisms for attention and stimulus selection and to develop experimental tests of these mechanisms, using optogenetics techniques. He also develops methods for analysing neuroscientific data in order to extract neural correlates of cognitive processes and to develop biomarkers for psychiatric diseases.



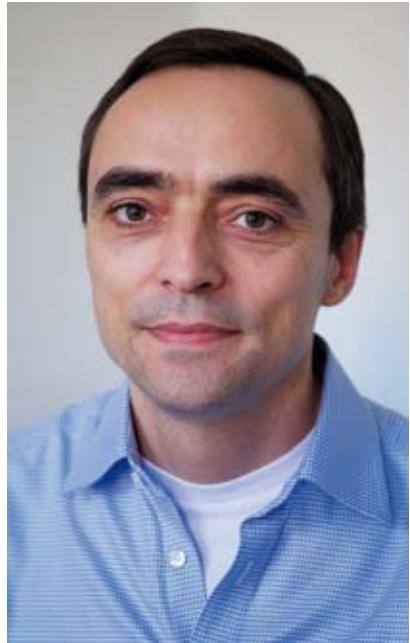
### **New memberships of boards and committees**

#### *Scientific boards and committees*

- Prof. Bas Bloem became a member of Congress Scientific Programme Committee of the Movement Disorder Society and an associate editor of the *Journal of Parkinson's Disease*.
- Dr Barbara Franke became an associate editor of the *American Journal of Medical Genetics Part B, Neuropsychiatric Genetics*.
- Prof. Alexander Geurts became a member of the scientific committee of the Dutch Brain Foundation and was appointed associate editor of *Rehabilitation Research and Practice*.
- Dr Judith Homberg has become a member of the editorial board of the international journal *Behavioural Pharmacology*.
- Prof. Roy Kessels became member of the scientific advisory board of the Federation of European Neuropsychological Societies and was elected chair of the board of directors of the Dutch Neuropsychological Society.
- Prof. Gerard Martens became a member NWO-Earth and Life Sciences Committee for Evaluation of Innovational Research ('Vernieuwingsimpuls'; Veni) and Board member of the educational institute Molecular Sciences at Radboud University Nijmegen.
- Prof. Eric Roubos became Associate Editor of *Frontiers in Endocrine Science*.
- Prof. Dick Stegeman became editor of the *European Journal of Applied Physiology* and a member of the management team of the NeuroControl consortium (NWO 'Innovative Medical Devices Initiative').

## Director: Prof. Guillén Fernández

Guillén Fernández trained as a neurologist and cognitive neuroscientist in Bonn, Magdeburg, and Stanford before becoming a founding Principal Investigator at the Donders Center for Cognitive Neuroimaging in 2002. Since then, he became a full professor (in 2006), head of the Cognitive Neuroscience department (in 2010) and director of the Donders Center for Neuroscience (also in 2010). In his research on human cognitive neuroscience, he specializes in the cerebral basis of memory, emotion and the way they interact. He received an Advanced Investigator Grant from the European Research Council (in 2010).



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- Prof. Hans van Bokhoven was elected to the Board of the Dutch Society for Human Genetics and became a member of the Evaluation Committee of the French National Research Agency, Neurosciences and was invited to join the editorial board of the *World Journal in Medical Genetics*.
- Prof. Baziel van Engelen was elected Research Director of the European Neuromuscular Centre.
- Dr Bart van den Warrenburg was chosen as an executive board member of the European Ataxia Study Group and became chairman of a task force of the European Federation of Neurological Society.
- Dr Marcel Verbeek became Associate Editor of the Journal of Alzheimer's Disease and editorial board member of the *International Journal of Molecular Epidemiology and Genetics*.
- Prof. Myrra Vernooij-Dassen was asked to become a member of the Joint Programming Alzheimer European Concerted Action.

### *Economic, societal valorization and regional involvement*

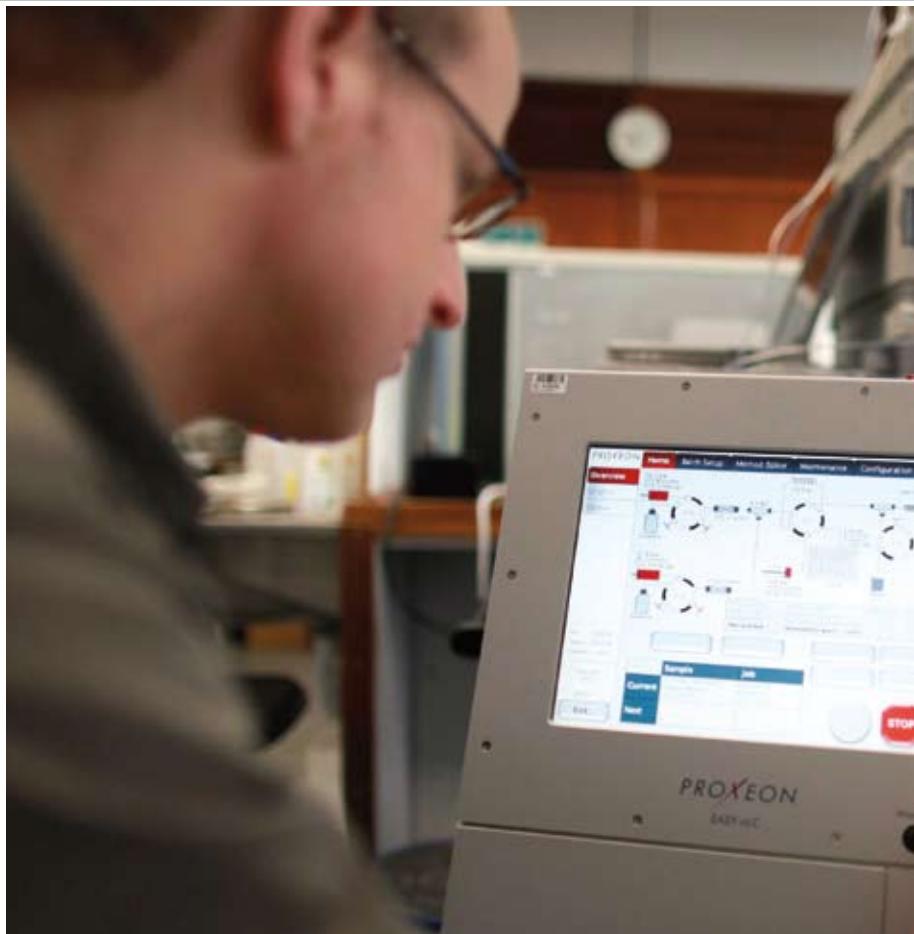
- Bonaparte software for victim identification – which was developed by the University for the Dutch Forensic Institute – was first deployed successfully after the Tripoli airplane disaster.
- A one-day symposium entitled 'Intelligent Machines' was held in Nijmegen to transfer knowledge on machine learning to commercial companies. The meeting attracted 200 visitors, a third of whom were from industry.
- The national ParkinsonNet ([www.ParkinsonNet.nl](http://www.ParkinsonNet.nl)) reached full national coverage by the end of 2010 and the national health insurance companies took the strategic decision to structurally fund its Nijmegen-based back office.

### **Future research**

DCN intends to further align its research with the four themes of the Donders Institute: Language & Communication; Perception, Action & Control; Learning, Memory & Plasticity and Brain Networks & Neuronal Communication and will encourage increased collaboration across them. Another goal is further integration of the clinical research activities of the University Medical Center with the more fundamentally oriented research on cognition using genetics and optogenetics, animal models, quantitative methods and computational modelling. Opportunities include cohort studies using functional MRI to study cognitive processes in patients suffering from diseases such as stroke, Parkinson's disease, ADHD and dyslexia.

# Institute for Genetic and Metabolic Diseases

At the Institute for Genetic and Metabolic Diseases (IGMD) scientists from a range of disciplines engage in research on genetic and metabolic diseases, using a bench-to-bedside approach. Within the Institute's nine inter-related research themes, fundamental, applied and clinical researchers work closely together to answer specific, patient-related research questions that are designed to reduce the incidence of mortality, as well as the severity and duration of morbidity resulting from genetic and metabolic diseases. The intention is to elucidate the pathophysiology of specific diseases and develop novel diagnostic methods as well as innovative forms of treatment.



## Research themes

### *Functional imaging*

Functional imaging and monitoring is of vital importance for the diagnosis, treatment and follow-up of patients. Researchers in the Functional Imaging Group develop and clinically evaluate innovative, non-invasive functional imaging and monitoring techniques such as 2D and 3D Echography, NMR spectroscopy, Near Infrared Spectroscopy (NIRS) and radioisotope imaging (PET and SPECT). The ultimate goal is timely detection of tissue damage in early life as well as in adults and the ageing population.

### *Molecular gastro-enterology and hepatology*

This research programme was set up to establish a comprehensive understanding of human gastrointestinal diseases at the molecular level, with the ultimate goal of discovering novel paradigms for effectively treating patients. The main focus is on polycystic liver disease, an autosomal dominant disorder. Although this is a rare disorder, it provides a unique opportunity to study human cystogenesis. Researchers in this translational programme identify key intracellular signalling pathways in PCLD in order to find

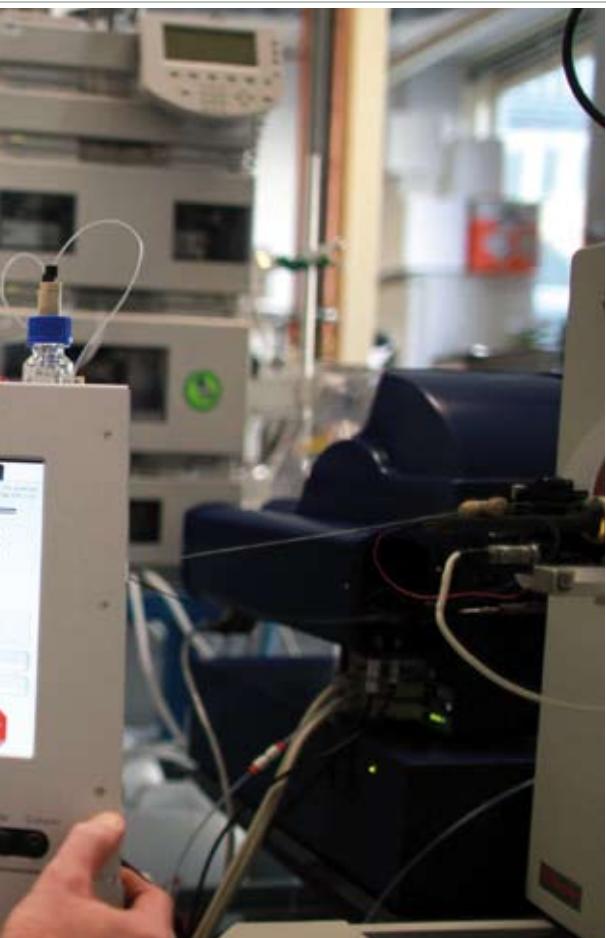
potential therapeutic targets that can be tested in clinical trials. The other research lines include identifying genetic aspects of chronic pancreatitis, the molecular pathology of inflammatory bowel diseases and research on the prevention of complications associated with severe intestinal failure.

### *Genomic disorders and inherited multi-system disorder*

Genetic factors are important in most human diseases and traits. This group focuses on finding such genes in order to provide better patient care. Topics include mental retardation, congenital abnormalities, psychiatric disorders, brain development and individual responses to treatment due to pharmacogenetic factors.

### *Glycosylation disorders*

This research focuses on the complex biosynthetic and catabolic pathways of glycans in health and disease, with a clinical and biochemical emphasis on Congenital Disorders of Glycosylation (CDG). Glycosylation is a biochemical process of post-synthetic modification that occurs in most proteins and in all cell types. In parallel with developing novel analytic techniques, the research group applies a broad range of biochemical, genetic and cell bio-



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Prof. P.M.T. Deen (o)

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Prof. J.P.H. Drenth (o)

Prof. W.F.J. Feitz (o)

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Prof. A.R.M.M. Hermus (o)

Prof. L.P.W.J. van den Heuvel (o)

Prof. J.G.J. Hoenderop (o)

Prof. M.T.E. Hopman (o)

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Prof. B. Wieringa (o)

### Tenured

Full Professors 13.3 FTE

Associate Professors 9.2 FTE

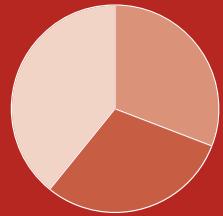
Assistant Professors 11.4 FTE

Researchers 5.5 FTE

### Non-tenured

Researchers 50.0 FTE

Doctoral candidates 60.2 FTE



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

logical methods in order to identify new disease entities, improve current diagnostics and better understand pathophysiological mechanisms. These aspects are crucial to developing future therapeutic strategies.

### Healthy ageing / healthy living

Remarkable advances in medicine have allowed humans to live to quite unprecedented ages: average human life expectancy has increased from 45 years at the beginning of the 20<sup>th</sup> century to over 75 years at the beginning of the 21<sup>st</sup> century. Understanding the process of healthy ageing, as well as the role of exercise and activity in senescence, is the main topic of this research programme, which covers human *in-vivo* approaches all the way down to the genetic level. Living longer, however, does not necessarily mean living better. The metabolic syndrome, the central infirmity of the 21<sup>st</sup> century, is one of the major focuses of this research programme. Risk factors that contribute to the metabolic syndrome such as dyslipidemia, hypertension and insulin sensitivity are studied both separately and when combined in patients with multiple risk factors. The overall goal is to improve the health – and/or vitality – of individuals as they age.

### Hormonal regulation

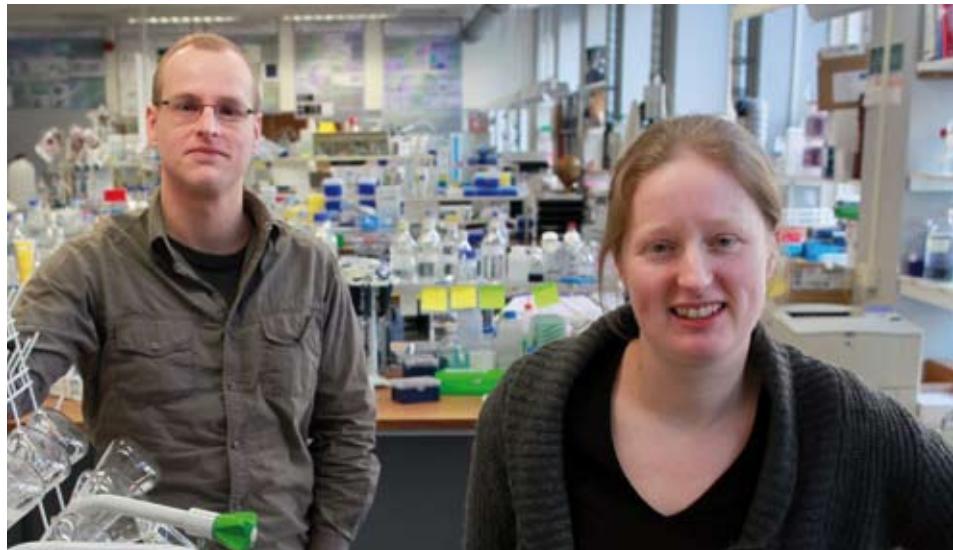
The research within this group focuses on adrenal diseases. Patient care and research on adrenal diseases are the *raison d'être* of the recently established Radboud Adrenal Centre (RAC). The mission of RAC is to be a centre of expertise for the diagnosis and treatment of adults and children with adrenal diseases. The four main areas of interest are hyper-/hypocortisolism, congenital adrenal hyperplasia, pheochromocytoma and primary aldosteronism.

### Iron metabolism

This research is designed to arrive at a full understanding of iron metabolism, in particular by identifying and characterizing novel factors that might mediate dysregulation of iron homeostasis in some of the world's most prevalent diseases, including anaemia related to chronic kidney disease, rheumatic diseases, hereditary haemochromatosis, iron loading anaemias, bacterial and malarial infections, cardiovascular disease and mild non-hereditary hepatic iron overload associated with alcohol abuse, hepatitis C and the metabolic syndrome. A key achievement was developing a mass spectrometry assay for the recently discovered iron regulatory hormone peptide hepcidin that is currently the subject of several translational studies.

# Institute for Genetic and Metabolic Diseases

Jessica Nouws MSc (Doctoral candidate) was awarded the Tweelingprijs by the Dutch Society of Paediatrics (on behalf of the Maarten Kappelle Foundation) for the best scientific article on Paediatrics. Dr Rutger Vogel (Researcher) received an NWO Veni grant for research on tumour invasion and metastasis. Both young researchers carry out research in the well-equipped laboratory at the Department of Paediatrics. High-tech equipment such as LC-MS/MS instrumentation from the Proteomics Technology Platform is used to analyze extremely small amounts of substances. See picture p. 80-81.



## Mitochondrial medicine

Within this group fundamental and applied studies ranging 'from molecule to man' are carried out under the guidance of scientists with a clinical, cell biological or bio-chemical background. The information gathered is used to develop new forms of treatment for diseases and adverse-health conditions in which the mitochondrial energy capacity is reduced. Defects of the human oxidative phosphorylation system are among the most frequently encountered inborn errors of metabolism and studying patients with these devastating disorders has revealed important information about the role that mitochondria play in the normal process of ageing and in neurodegenerative diseases such as Parkinson.

## Renal disorder

The kidneys play an essential role in several processes in our body including volume and osmo-regulation, electrolyte balance, and the excretion of metabolites and drugs. Within this theme the regulation of the physiological development of the kidney is studied in order to better understand the pathogenesis of kidney disorders, in order to be able to diagnose and ultimately cure or prevent them. These disorders include both acquired and inherited forms of kidney disease. Research projects are carried out at the genetic (gene defects, polymorphisms), molecular (transport proteins), and cellular (glomerular and epithelial cells) level. The results of fundamental and clinical research are integrated.

## Research facilities

IGMD research and patient care requires excellent laboratory equipment. State-of-the-art technology platforms are at the heart of this infrastructure, offering unique research opportunities. These include facilities for DNA sequencing, genome scanning, expression array, proteomics and metabolomics and glycomics. These platforms are the building blocks that are used to successfully apply genomics,

proteomics and metabolomics approaches and to bring the data together in a holistic systems biology approach to genetic and metabolic disease. The technology platforms are largely hosted by the Department of Human Genetics, the Department of Laboratory Medicine and the Laboratory of Genetic, Endocrine and Metabolic diseases. For researchers it is a continuing challenge to use of these facilities in their work and to incorporate this high-tech infrastructure in grant applications.

## Collaboration

There is frequent and fruitful collaboration with researchers from the other research institutes at the University and the Radboud University Nijmegen Medical Centre. Researchers from IGMD are active in a wide range of national and international networks. For example, Prof. Smeitink coordinates an IOP-Genomics research programme involving three Dutch universities and the Centre for System Biology and Bioenergetics. More than 35 research groups at the University and its Medical Centre with backgrounds in bio-informatics, physics, chemistry, physiology, pharmacology, biochemistry, clinical sciences and patient care, work together to model mitochondrial energy production, distribution and expenditure in the context of human disease. In addition, several IGMD researchers working on renal disorders participate in the Biokid consortium of Biomedical Materials Program (BMM).

Researchers in the Functional Imaging group participate in a European FP7 network on Beta cell Imaging (BetaImage) and those working in the renal disorders group participate in the European Network for the study on Orphan Nephropathies (Eunefron). Researchers engaged in Genome Disorders participate in the FP7 Collaborative Project TECHGENE (Technological innovation of high throughput molecular diagnostics of clinically and molecularly heterogeneous genetic disorders).

The IGMD collaborates with many outstanding research groups at universities and institutes, including:

- Harvard University, Boston, USA
- NIH, Bethesda, USA
- Karolinska Institute, Stockholm, Sweden
- Medical Research Council, Cambridge, UK
- Max Planck Institute on Aging, Cologne, Germany
- University of Leuven, Belgium
- Mayo Clinic, Rochester, USA
- University of Birmingham, School of Experimental Medicine, UK.

### Awards and grants

Dr Roos Masereeuw was awarded the Galenus Research Prize for her innovative research on the regulation of drug transporters in renal damage and repair.

Dr Dirk Lefeber received the 2010 SSIEM Award for the best oral presentation of the results he published in the high-impact journals *Cell* and *Brain*.

Prof. Wiebke Arlt (Birmingham, UK) was appointed Valkhof Visiting Professor in 2010. Her presence gave a strong stimulus to the recently established Radboud Adrenal Centre.

Dr Cees Noordam received the 'Best clinical paper' award during the 'Dutch Endocrinology Days' meeting, for his publication in the *New England Journal of Medicine* in 2009.

Major NWO and ZonMw funding was obtained for the Centre for Systems Biology and Bioenergetics, for developing *in silico* models that will integrate what's currently known about the energy metabolism of the human muscle. Prof. Jan Smeitink was appointed as coordinator.

Prof. Hans Spelbrink was awarded a Vici grant from the NWO-ALW research council for his proposal: 'Our other genome: organizing an evolutionary mishmash'.

Dr Rutger Vogel was awarded a Veni grant from the NWO-ALW research council for his proposal: 'The more the better? Towards treatment of complex I deficiency by targeted mitochondrial biogenesis'.

Christiaan Mooij MSc acquired an AGIKO stipend from ZonMw, designed to enable qualified doctors to take a follow-up course that combines clinical and scientific training.

As part of the international ENS@T-CANCER consortium, Dr. Henri Timmers obtained a 7th Framework Programme (Theme Health) grant from the European Union for a project entitled 'European Network for the Study of Adrenal Tumours - Structuring clinical research on adrenal cancers in adults'.

Several young IGMD researchers received Young Investigator awards and poster prizes from various learned societies, *e.g.* the Dutch Society of Hepatology, the Dutch Society of Nephrology, the Dutch Society for Inborn Errors of Metabolism, the Society for Paediatrics and the Dutch Society of Toxicology.

### Research results

A major step forward in identifying mutations for which no other genome-wide approach is applicable, was made in a recent study by Dr Alexander Hoischen and colleagues in the group led by Prof. H. Brunner and Prof. J. Veltman. Using exome sequencing, they identified *de novo* mutations of the *SETBP1* gene causative to the lethal Schinzel-Giedion syndrome. (*Nat Genet.* 2010; 42(6):483-5).

In a large collaboration study Dr T. Radstake and collaborators performed the first large genome-wide association study of systemic sclerosis and identified *CD247* as a new susceptibility locus for this lethal disease. These findings support the strong autoimmune component underlying SSc pathogenesis. (*Nat Genet.* 2010; 42(5), 426-429).

An important breakthrough was made in understanding the genetic basis of Hypospadias, a common congenital malformation of the male external genitalia. In a genome wide association study Loes van der Zanden MSc and colleagues identified diacylglycerol kinase as a major risk gene for hypospadias (*Nat Genet.* 2011;43(1):48-50. *Epab* 2010 Nov 28).

An important advance was made in metabolic enzyme research. Dr H. Nouws and Dr L. Nijtmans – in Prof. Smeitink's group – revealed a novel and essential role for Acyl-CoA dehydrogenase 9 (ACAD9) in oxidative phosphorylation. They showed that a mutation in ACAD9 causes an isolated complex I deficiency in a subset of patients with mitochondrial disease. (*Cell Metab.* 2010 Sep 8;12(3):283-94).

The group working on Glycosylation Disorders (Dr D. Lefeber, Dr E. Morava and Prof. R. Wevers) identified the long-sought polypropenol reductase required for the synthesis of dolichol, the lipid anchor for N-glycosylation. Extensive collaborative studies involving animal models and human patients with a congenital disorder of glycosylation, highlighted typical clinical and biochemical features and showed the existence of a bypass biosynthetic pathway. (*Cell.* 2010;142(2):203-17).

Drs J. Glerich and H. Wessels contributed to the important discovery of a hitherto unknown (fourth) oxygen producing pathway. (*Nature.* 2010; 464(7288):543-8).

# Institute for Genetic and Metabolic Diseases

## Key publications

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Vissers, L.E.L.M., Ligt, J. de, Gilissen, C., Janssen, I., Steehouwer, M., Vries, P. de, Lier, B. van, Arts, P., Wieskamp, N., Rosario, M. del, Bon, B.W.M. van, Hoischen, A., Vries, B.B. de, Brunner, H.G. & Veltman, J.A. (2010). A de novo paradigm for mental retardation. *Nature Genetics*, 42(12), 1109-12.

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Dissertations: 23  
Scientific publications: 512  
Patents: 1

## Director: Prof. Jan Smeitink

Prof. Jan Smeitink has been Head of the Department of Metabolic and Endocrine Disorders at the University Children's Hospital of the Radboud University Nijmegen Medical Centre since 1996. In 1997 he set up the Nijmegen Centre for Mitochondrial Disorders, which is recognized internationally as a centre of excellence for patient care, diagnostics and research of patients suffering from disturbances in the mitochondrial energy metabolism. In 2001 he became an extraordinary professor in Mitochondrial Disease and in 2006 a full professor in Mitochondrial Medicine.



## Institute for Genetic and Metabolic Disease

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## Societal impact

Members of the IGMD sit on a number of governmental advisory boards, including the Dutch Health Council, and participate in numerous national and international (patient) organizations. They frequently promote research at meetings involving the general public as well as at conferences and other forums. The Institute actively encourages collaboration between commercial companies and academia.

Clinical and research staff at the Nijmegen Center for Mitochondrial Disease organized the second Mitochondrial Disease Day for patients and parents. More than 150 people participated in this much appreciated event, which included lectures, workshops and informal interactive sessions. The Energy4all foundation honoured the NCMD for further research on mitochondrial disease.

The Radboud Adrenal Centre (RAC) organized a very well-attended opening symposium with a faculty of distinguished national and international speakers – experts in each of the four areas of interest within the RAC.

## Future research

The research focus in Functional Imaging is on multi-modality imaging for cardiac and cerebral applications, in order to identify vulnerable plaque and diabetic patients; the group will work on developing and characterizing novel tracers for beta-cell imaging in animal models of diabetes.

The gastro-enterology group will continue two randomized clinical trials on polycystic liver disease. They are genotyping a new mouse model for polycystic liver disease in order to facilitate investigating the pathogenetic mechanism that leads to polycystic liver disease and to use it as a model for studying the effect of pharmacological interventions designed to prevent or reduce the incidence of polycystic livers.

Healthy Ageing research focuses on the mechanisms involved in chronic diseases caused by inactivity. The ultimate aim of the Mitochondrial Medicine group is to make a substantial contribution to developing a treatment for mitochondrial disease.

The Hormonal Regulation group focuses its research on the adrenal diseases pheochromocytoma/paraganglioma and congenital adrenal hyperplasia with the aim of better understanding the molecular mechanisms underlying these diseases and improving therapy.

In the field of Iron Metabolism new insights into mitochondrial iron homeostasis, soluble hemojuvelin and hepcidin will be translated into novel diagnostic assays and therapeutic strategies that can be implemented in the clinic.

The goal of research on renal disorders is to further strengthen the group's international research position in this field and to become the top national reference centre for patients with these disorders. The group is also working on the use of pharmacological chaperones for the treatment of certain genetic tubular disorders.

# Research Institute for Oncology

The main aim of the Research Institute for Oncology is to advance innovation in translational research in oncology and to reduce the morbidity and mortality of cancer. Researchers from several disciplines unravel the pathology of tumours, develop new diagnostics and therapies, and improve standards of care.



The Institute – one of five research institutes in the Radboud University Nijmegen Medical Centre – was founded in 2008 to coordinate and strengthen research in oncology and oncology-related topics. Built on the tradition and strong reputation of existing research groups, the Institute operates under the umbrella of the Radboud University Centre for Oncology (RUCO).

Key principles are:

- Research is patient-centred and related to patient care
- Research is arranged in themes, which are multidisciplinary and offer extra value when compared to existing structures
- Close collaboration with the other University research institutes, such as NCMLS and NCEBP, is considered to be very important.

The five themes of the research institute are:

#### *Theme 1. Hereditary cancer and cancer-related syndromes*

Researchers working on this theme investigate the causes and early detection of hereditary and other cancer-related syndromes, develop improved detection methods for specific forms of hereditary cancer, and study health care and psychosocial aspects.

Sub-themes:

- Genetic causes and mechanisms
- Recognition, prevention and treatment of hereditary cancer
- Patient empowerment, psychosocial care, quality of care and ethical dilemmas.

#### *Theme 2. Age-related aspects of cancer*

Cancer has characteristics that differ per age group. Researchers working on this topic investigate the causes of cancer in the young, the age-related pathology of tumours and its consequences, the need for specific approaches for special age groups, including pharmacology, developing programmes for early clinical trials in children, and adapting treatments for the elderly. Sub-themes are:

- Paediatric oncology
- Adolescents and Young Adults (AYAs) and cancer
- The older adult.

#### *Theme 3. Translational research*

In recent years advances in the biology and genetics of cancer have led to novel diagnostic, prognostic and therapeutic approaches. Research within this theme is designed to integrate state-of-the-

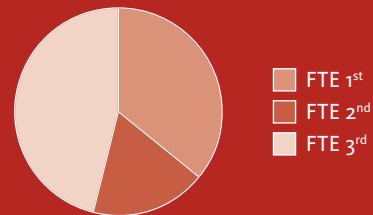
## Staff

Prof. T. van Achterberg (o)	Prof. H.A.M. Marres (o)
Prof. G.J. Adema (o)	Prof. L.F.A.G. Massuger (o)
Prof. D.C. Aronson (o)	Prof. M.A.W. Merkx (o)
Prof. J.O. Barentsz (o)	Prof. P.F.A. Mulders (o)
Prof. A.C. Begg (e)	Prof. W.J.G. Oyen (o)
Prof. S.J. Berge (o)	Prof. J.B. Prins (o)
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Prof. R.P.T.M. Grol (o)	Prof. A.L.M. Verbeek (o)
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Prof. P.M. Hoogerbrugge (o)	Prof. K.C.P. Vissers (o)
Prof. N. Hoogerbrugge-van der Linden (o)	Prof. P. Wesseling (o)
Prof. J.B.M.J. Jansen (o)	Prof. G.J. van der Wilt (o)
Prof. J.H.A.M. Kaanders (o)	Prof. J.H.W. de Wilt (o)
Prof. L.A.L.M. Kiemeney (o)	Prof. J.A. Witjes (o)
Prof. A.J. van der Kogel (o)	Prof. T.J.M. de Witte (o)
Prof. J.H.J.M. van Krieken (o)	Prof. Th. Wobbes (o)
Prof. C.J.H.M. van Laarhoven (o)	Prof. G.A. Zielhuis (o)
Prof. J.W.H. Leer (o)	

<b>Tenured</b>		
Full Professors	16.3	FTE
Associate Professors	4.9	FTE
Assistant Professors	18.5	FTE
Researchers	15.1	FTE

<b>Non-tenured</b>		
Researchers	65.2	FTE
Doctoral candidates	69.9	FTE



art genetic and genomic information, tumour imaging and phenotyping, including invasive and metastatic properties, with novel targeted treatment options such as epigenetic, metabolic and immunological (vaccine-based) approaches, right up to the level of pre-clinical and clinical trials. Researchers cooperate closely with colleagues working on the other themes. Sub-themes are:

- Genomics and epidemiology
- Diagnosis and staging
- Pre-clinical testing
- Targeted therapies
- Clinical implementation.

### Theme 4. Quality of care

Health care criteria include Quality of Life, cost effectiveness, clinical decision making and implementation-related issues (which are largely covered by the NCEBP). The new knowledge and tools that are derived from this type of research are used to improve care for cancer patients. Sub-themes are:

- Behavioural medicine
- Decision making
- Quality of care.

### Theme 5. Aetiology, screening and detection

Within this theme research takes place on genetic and lifestyle causes for the non-Mendelian forms of cancer and the role of such factors in prognosis. A second focus is on the efficacy and effectiveness of policies for cancer screening (general population) and routine follow-up (clinical population). Sub-themes are:

- The development, early evaluation and diagnostic and prognostic efficacy of biomarkers and imaging techniques in everyday clinical practice
- Aetiology.

### Research facilities

The Institute supports technological and other platforms which are crucial to its research and which also serve the needs of other research institutes, such as the microscopy centre, functional imaging, medical technology assessment, genomics and proteomics, bioinformatics and biostatistics. The following multi-institutional platforms are supported:

- Imaging
- High-throughput genomics
- Proteomics

# Research Institute for Oncology

Prof. Bart Kiemeney (Full Professor) specializes in the epidemiology of cancer. He studies the causes of bladder cancer and prostate cancer, in particular hereditary sensitivity and lifestyles that enhance the risk of these tumours developing.



- Unit for clinical application of new drugs
- Unit for psychosocial research tools
- Biostatistics
- Microscopy centre
- Central Animal Facility
- Bio-informatics
- Centre for minimal invasive treatment (Mitec).

## Collaborations

Scientists at the Institute participate in the following organizations:

- In 2010 Prof. Bart Kiemeney set up EuroTARGET, a collaborative European project on targeted therapies for renal cell cancer, entitled 'Genetic and tumour-related biomarkers for response and toxicity'.
- Prof. Myrra Vernooy, Dr Yvonne Engels and Prof. Kris Vissers received a grant within the EU's FP7 programme IMPACT (Implementation Palliative Care IMplementation of quality indicators in PAlliative Care sTudy).
- The Radboud Translational Oncology Program (RTOP), with Prof. Winette van der Graaf and Prof. Wim Oyen as members of the executive committee, helped establish the Dutch Imaging Hub (DIH) in collaboration with Roche. DIH – a multicentre research facility – is supported by three University Medical Centres in the Netherlands (UMC St Radboud, UMC Groningen en VUMC).
- Prof. Bart Kiemeney – together with Dr C van Asperen (LUMC), Prof. H.F.A. Vasen (StOET), and Dr G.W. Verhaegh – received a grant in the context of IMPACT-NL for research on 'Novel screening methods for prostate cancer in Dutch BRCA1/2 mutation carriers' from the British Association for International Cancer Research.

## Awards and acknowledgements

- The Institute is very successful in acquiring competitive research funds from the Dutch Cancer Society (KWF) and the Netherlands Organisation for Scientific Research (NWO). Projects funded by KWF and NWO include the following:
  - Prof. Peter Friedl received a Vici award for research on Cancer invasion and metastasis, Dr Mangala Srinivas received a Veni grant for a research project entitled: 'Cell therapy: what happens to these cells inside a patient?'.
    - Dr Sita Vermeulen received a Rubicon grant for the project: 'Elucidating the relation between inflammation and urinary bladder cancer via multi-SNP analysis of genome-wide data.'
    - Dr Jeroen Hasselaar received a NWO grant for the project 'Telemedicine in palliative patients'.
    - Prof. Jelle Barentsz received a ZonMw Agiko clinical research grant on behalf of Derya Yakar for the project 'Exploring the clinical value of multi-modal MR imaging in prostate cancer'.
    - Prof. Fred Witjes received a ZonMw Agiko clinical research grant on behalf of Max Bruins for the project 'Optimizing treatment for patients with non-metastatic muscle-invasive bladder cancer: identifying prognostic factors for treatment decisions'.
    - Prof. Bart Kiemeney received a ZonMw Agiko clinical research grant on behalf of Ruben Cremers for the project 'Hereditary forms of aggressive prostate carcinoma'
    - Dr Joost Lesterhuis and Dr Toine van der Heijden were awarded a personal KWF fellowship for the projects 'Cancer chemo-immunotherapy: exploiting the immunogenic momentum of platinum chemotherapy' and 'Biomarkers for diagnosis and prognosis of bladder cancer', respectively.
    - Dr Katja Aben, Prof. Bart Kiemeney, Dr Michelle van Rossum received a KWF grant to study the 'Genetic susceptibility of melanoma'.

- Dr Jan Bussink, Prof. Otto Boerman, Prof. Hans Kaanders received a KWF grant for a project entitled 'PET/CT-guided early response prediction and optimization of combined modality treatment with radiotherapy and EGFR inhibition'.
- Prof. Hans de Wilt received a KWF grant for a project entitled 'Chemoradiotherapy for rectal cancer in the distal rectum followed by organ-sparing transanal endoscopic microsurgery (multicenter national phase II study)'.
- Prof. Jan Bussink J, Prof. Paul Span, and Prof. Hans Kaanders received a KWF Grant for a project entitled 'Activation of the PI3-K/Akt pathway and radiation resistance mechanisms in carcinoma of the larynx: validation in a hypoxia targeting randomized trial'.
- Prof. Myrra Vernooy, Dr Yvonne Engels, and Prof. Kris Vissers received a grant from the Berg in't Zadel Foundation (on the advice of the KWF) for the project 'PIJNSEIN: Implementation of the guideline 'pain and cancer"'.
- Prof. Peter Hoogerbrugge received a grant from the KiKa Foundation for the project 'Genetic pathways pre-B ALL'.
- Prof. Carl Fidgor received the prestigious 2009 Koningin Wilhelmina research prize (KWO) for carrying out multidisciplinary research on the role of the immune system in the fight against cancer.
- Dr Tom Scheenen was elected as a Member of Honour of the Royal Belgium Society of Radiology (KBVR) for his achievements in the use of magnetic resonance spectroscopy for detection and localization of prostate cancer.
- Dr Ingrid Desar received the Pieter De Mulder award during the annual meeting of Dutch Society of Medical Oncology (NVMO).
- Thomas Hambrock MSc received a Lauterbur Award, a prestigious prize from the Society of Body Computed Tomography and Magnetic Resonance.
- Prof. Ellen Kampman received an Alpe d'HuZes Professorship Award.

## Research results

Scientists at the Institute characterized mutations/deletions in the number of genes, with the potential for improving diagnostics or delivering a predictive value in cancer treatment. The group led by Dr Joop Jansen characterized the somatic mutations in *EZH2* gene in myelodysplastic syndrome. The group led by Prof. Nicolien Hoogebrugge showed that *IKZF1* deletions can predict relapse in paediatric precursor B-ALL. The group led by Dr Frank van Leeuwen identified the protein encoded by the *BTG1* gene, which is frequently deleted in paediatric Acute Lymphoblastic Leukaemia (ALL), as a key determinant of glucocorticoids (GC) responsiveness. This could create novel opportunities for improving the efficacy of GC-based therapies in ALL and other haematological malignancies. The group led by Prof. Gosse Adema identified the prognostic significance of DC-SCRIPT for breast cancer.

The group led by Dr Jolanda de Vries identified a new clinical application for a mixture of commonly used preventive vaccines as a source of number TLR ligands in clinical-grade purity in generating Th1-inducing clinical-grade mature dendritic cells that are currently explored in clinical trials.

The group led by Prof. Kees Punt en Dr Iris Nagtegaal continued their successful clinical and translational research in colorectal cancer, with the large database from the CAIRO studies as the primary source. Novel insights into clinical and laboratory prognostic and predictive markers were presented. This research has led to collaborations with LUMC (Prof. Henk Jan Guchelaar), VUmc (Prof. Gerrit Meijer), Erasmus MC (Prof. Carin Uyl-de Groot) and NKI/AvL (Prof. Jan Schellens).

Coal tar is an effective treatment for psoriasis and eczema, but it contains several carcinogenic compounds. The groups led by Prof. Bart Kiemeny and Prof. Peter van de Kerkhof demonstrated that coal tar treatment is not associated with an increased risk of cancer, which suggests that it can be maintained as a safe treatment in dermatological practice.

The group led by Dr Eric van Rijswijk has produced compelling arguments for primary care involvement in young adult cancer care, given that family physicians around the globe are currently not routinely involved.

## Societal impact

Cancer – a major health problem in developed countries – has an enormous physical and mental impact on patients and their families. Improving prevention, diagnosis and therapy as well as psycho-social assistance are therefore crucial. Researchers at the Institute are members of various national (Dutch Cancer Society, Netherlands Foundation for the Detection of Hereditary Tumours, Biobanking and Biomolecular Resources Research Infrastructure, Dutch Society for Chirurgic Oncology, the KWF committee Alpe d'HuZes) and international (Scientific Council, International Agency for Research on Cancer, Trial Steering Committee of SELENIB, Editorial Board European Journal of Cancer) advisory boards. A number of new appointments are listed below:

- Prof. Han van Krieken became a member of the German Academy of Sciences Leopoldina.
- Prof. Kris Vissers became a member of the Executive Board of the World Institute of Pain.
- Prof. Winette van der Graaf became the Chairwoman of the NFU (Dutch Federation of University Medical Centre's) Committee for Child Oncology.
- Prof. Wim Oyen became the Chairman of the Oncology Committee of the European Association of Nuclear Medicine.
- Dr Bert van der Rijden became the Chairman of the international Netherlands-Belgium-Switzerland association 'Molecular diagnostics of Haematological Malignancies' (MODHEM).

# Research Institute for Oncology

## Key publications

Ansems, M., Hontelez, S., Loosman, M.W.G., Karthaus, N., Bult, P., Bonenkamp, J.J., Jansen, J.H., Sweep, F.C., Span, P.N. & Adema, G.J. (2010). DC-SCRIPT: nuclear receptor modulation and prognostic significance in primary breast cancer. *Journal of the National Cancer Institute*, 102(1), 54-68.

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Dissertations:	30
Scientific publications:	565
Patents:	3

## Director: Prof. Kees Punt

Kees Punt is a medical oncologist with special expertise in gastrointestinal cancer, melanoma, and tumour immunology. In 2001 he was appointed Professor of Biology Therapy of Cancer. His research interests are colorectal cancer and melanoma, with a specific focus on dendritic cell vaccines. He is Chairman of the Dutch Colorectal Cancer Group (DCCG), Principal Investigator of DCCG CAIRO studies and a member of the Scientific Council of the Dutch Cancer Foundation (KWF).



## Research Institute for Oncology

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- Prof. Fred Sweep was re-elected as a member of the EORTC Board.
- Dr Joop Jansen was elected as a member of the Scientific Board of the Dutch Haematology Society.
- Dr Eric van Rijswijk is the chairman of the newly formed WONCA association: Special Interest Group Oncology and Palliative Care.

## Future research

The research focus of the Institute involves all aspects of hereditary cancer in selected diseases: renal cancer, breast cancer and colorectal cancer. Research on cancer in children will focus on detecting pathways of leukemogenesis in ALL that may be targets for novel treatment approaches, detecting variants in genes relevant for cytotoxic drug metabolism – affecting the outcome and toxicity of conventional chemotherapy – and optimising immunotherapy in children with cancer.

In translational research researchers aim to arrive at new insights into:

- cancer-related target genes and pathways
- associations between genetic variants and cancer susceptibility, prognosis and therapy response
- diagnosis through molecular analyses, including the potential for personalized therapy
- the efficacy of functional imaging in relation to diagnosis, prognosis and therapy

- the mechanisms underlying invasion and metastasis
- novel molecular markers for imaging
- the efficacy of novel metabolic and epigenetic drugs for therapy and novel vaccine-based therapeutic strategies.

Areas of research in AYA include genetics, epidemiology, pharmacokinetics, predictive factors, and late effects of treatment, psychosocial and quality-of-life issues.

In relation to quality of care, researchers will follow patients from the beginning of cancer care in order to link physician-reported outcomes to patient-reported outcomes and quality indicators. Then it will be possible to identify relevant factors affecting behaviour and care and to identify their influence on illness and survival.

In screening detection and aetiology researchers collect new evidence on:

- The efficacy and effectiveness of
  - diagnostic and prognostic biomarkers for cancer
  - diagnostic and prognostic imaging modalities for cancer
  - cancer screening in the general population
  - routine follow-up policies for cancer patients
- Constitutional and lifestyle/environmental risk factors affecting cancer.

# Nijmegen Institute for Infection, Inflammation and Immunity

The Nijmegen Institute for Infection, Inflammation and Immunity (N4i) brings together strong research groups that focus on infectious diseases, inflammation and immunity – areas that are intimately connected. N4i's ambition is to achieve national and international leadership in research in these areas. This research, which is inspired by observations at the bedside, is designed to improve the diagnosis, treatment and prognosis of patients with infection, inflammatory and immunological disorders.



The research focuses on four themes that link Infection, Inflammation and Immunity.

## *Theme 1. Pathogenesis and modulation of inflammation*

Although infectious agents are the prime causes of inflammation, any tissue damage will induce an inflammatory response. Research within this theme is designed to yield new insights into the pathogenesis of many diseases. Issues that are addressed include:

- the recognition of pathogens by the host
- inflammasome activation and cytokine responses
- the pathogenesis of major bacterial pathogens (e.g., pneumococci, staphylococci, meningococci) and viral pathogens (Picornaviruses; dengue virus)
- the mediator response in sepsis
- developing highly sensitive and specific molecular imaging tools in infection and non-infectious inflammation
- mechanisms of tissue damage
- the inflammatory response in chronic obstructive pulmonary disease (COPD) and its effect on muscle weakness
- further exploring the therapeutic effects of TLR-4 antagonism
- further exploring therapies to preserve mucosal integrity in aggressive chemotherapy

- developing outcome instruments for assessing inflammation and response to treatment.

## *Theme 2. Invasive mycoses and compromised host*

Within this theme invasive fungal infections are studied in relation to the sophisticated medical treatments given to immuno-compromised and frail patients. Research focuses on understanding host defence mechanisms, in particular:

- the recognition of fungal pathogens by the host
- the immunogenetics of *Candida* infection
- designing better diagnostics and therapies for aspergillosis and other invasive fungal infections
- exploring the epidemiology, mechanism and consequences of resistance to antifungal drugs
- exploring the use of immunotherapy in systemic fungal infection in humans

## *Theme 3. Poverty-related infectious diseases*

In developing countries infectious diseases are still a major cause of mortality and poverty increases vulnerability to infections such as tuberculosis, HIV and malaria. Within this theme the following topics are addressed:

## Staff

Prof. J.H.M. Berden (o)  
 Prof. W.B. van den Berg (o)  
 Prof. P.N.R. Dekhuijzen (o)  
 Prof. C.A. Dinarello (o)  
 Prof. J.M.D. Galama (o)  
 Prof. R. de Groot (o)  
 Prof. P.W.M. Hermans (o)  
 Prof. L.B. Hilbrands (o)  
 Prof. J.G. van der Hoeven (o)  
 Prof. A.J. Hoitsma (e)  
 Prof. I. Joosten (p)  
 Prof. P.C.M. van de Kerkhof (o)  
 Prof. B.J. Kullberg (o)  
 Prof. R.F.J.M. Laan (o)  
 Prof. J.W.M. van der Meer (o)  
 Prof. M.G. Netea (o)  
 Prof. W.J.G. Oyen (o)  
 Prof. P. Pickkers (o)  
 Prof. P.L.C.M. van Riel (o)  
 Prof. R.W. Sauerwein (o)  
 Prof. J. Schalkwijk (o)  
 Prof. G.J. Scheffer (o)  
 Prof. P.A.G.M. de Smet (o)  
 Prof. D. van Soolingen (e)

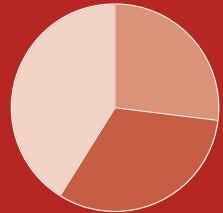
Prof. D.W. Swinkels (p)  
 Prof. A.J.A.M. van der Ven (o)  
 Prof. P.E. Verweij (o)  
 Prof. A. Voss (o)

### Tenured

Full Professors	9.2 FTE
Associate Professors	4.3 FTE
Assistant Professors	11.1 FTE
Researchers	13.6 FTE

### Non-tenured

Researchers	42.1 FTE
Doctoral candidates	64.2 FTE



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

- the pathogenesis of malaria and developing vaccines for malaria
- innate host defence against *Mycobacterium tuberculosis* and the role of mycobacterial genotypes
- optimal diagnosis and treatment of tuberculosis (TB), with a focus on complicated TB
- evidence-based prevention and treatment of HIV/AIDS in the context of intravenous drug use in Indonesia
- optimal anti-HIV and anti-TB treatment in resource-poor settings and in children.

### Theme 4. Auto-immunity, transplantation and immunotherapy

Research on inflammatory response is designed to arrive at new insights into the pathogenesis of infectious diseases and non-infectious inflammatory disorders. Within this theme research focuses on:

- phenotypes of auto-immune diseases of the skin
- prediction of the course of chronic inflammatory rheumatic diseases and response to treatment
- initiation of the autoimmune response, the mechanisms of tissue damage, and optimal treatment strategies for Systemic Lupus Erythematosus (SLE)
- developing biomarkers for monitoring immune states and immunosuppressive treatment efficacy

- immunological tolerance after transplantation and transfusion as well as in infection and autoimmunity
- exploring the use of dendritic cells, regulatory T cells and NK cells for autoimmune diseases and transplant-related immunotherapy
- designing new immunostimulatory drug treatments
- developing vaccines for pneumococci and *Plasmodium falciparum*
- assessing the severity of psoriatic phenotypes and responses to treatment.

### Research facilities

N4i is a centre of excellence for clinical translational research that combines research at the bedside with that at the bench – and vice versa. The core components of the Institute are clinical departments (General Internal Medicine, Paediatrics, Nephrology, Dermatology, Rheumatology, Haematology, Pulmonary diseases, Intensive Care Medicine and Nuclear Medicine) and dedicated research laboratories (those directly connected to the clinical departments as well as the laboratories Medical Microbiology, Clinical Pharmacy, Blood Transfusion and Transplantation Immunology and Tumour Immunology). The Institute makes use of the facilities of the Radboud University Nijmegen Medical Centre, *i.e.*:

# Nijmegen Institute for Infection, Inflammation and Immunity

Prof. Robert Sauerwein (Full Professor) studies the development of malaria vaccines. Malaria is caused by the microbial parasite *Plasmodium falciparum*, which is transmitted by Anopheles mosquitoes. On 18 May 2010 a new and state-of-the-art malaria unit opened. At this advanced facility, which is unique worldwide, mosquitoes can be reared and new vaccines can be developed and tested. See picture p. 92.



- the Animal Laboratory (CDL)
- the Microscopic Imaging Centre (light and electron microscopy, digital imaging, atomic force microscopy, flow cytometry, FRET and FRAP as well as *in-vivo* 7 Tesla NMR facilities for animals and humans )
- the Micro-array Facility Nijmegen
- the Nijmegen Proteomics Facility (2D electrophoresis, SELDI-TOF, MALDI-TOF, MALDI-LTQ and nano-LC LTQ-FT MS)
- the Centre for Molecular and Biomolecular Informatics
- the Clinical Research Centre Nijmegen
- the GMP facility.

In 2010 a new malaria unit was opened, with, state-of-the-art facilities for rearing parasites and mosquitoes in order to develop and test new medicines and vaccines.

## Collaboration

The research at N4i takes place within national and international research networks that focus on infection, inflammation and immunity. Apart from collaborations with outstanding laboratories in the western world, research at N4i also has fruitful partnerships with institutes in developing countries, in particular in Tanzania (KCMC, Moshi) and Indonesia (Eijkman Institute, the Universities of Indonesia and Bandung).

In 2010 Charles Dinarello, Professor of Infectious Diseases at the University of Colorado, Denver, was appointed Royal Netherlands Academy of Arts and Sciences (KNAW) visiting professor at N4i for six months. He is a world leader in cytokine research, especially interleukin-1, interleukin-18 and interleukin 32, IL-1F7 and anti-cytokine strategies in inflammatory disorders.

International research partners include:

- University of Colorado, USA
- University of Aberdeen, UK
- University of Barcelona, Spain
- Boston University, USA
- Kilimanjaro Christian Medical Centre, Tumaini University Moshi, Tanzania
- Eijkman Institute and University of Indonesia, Jakarta
- Padjadjaran University Bandung, Indonesia
- University of Manchester, UK
- University of Tromso, Norway
- University of Erlangen, Germany
- Hadassa University, Jerusalem, Israel
- Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania.

## Awards and acknowledgements

In 2010 N4i researchers successfully applied for several prestigious grants from ZonMw, NWO/ALW, the Dutch Kidney Foundation, Dutch Arthritis Association, as well as various European grants. Prof. M. Netea received the prestigious NWO Vici grant for work on training the natural immune response to infections.

Prof. P. Hermans and collaborators from Wageningen University Research, the Royal Tropical Institute and three biotechnology partners, received a project grant for a research programme involving developing an electronic platform for high throughput and real-time detection of biomarkers for inflammation.

Dr F. van Kuppeveld obtained a grant for establishing a European Training Network led by N4i scientists. He will coordinate this EUVIRNA programme, which offers 20 talented early-stage researchers multidisciplinary and intersectoral training and

prepares them for a future leading role in European molecular virology research and antiviral drug development.

The Dutch Kidney Foundation (DKF) awarded two grants to renal research consortia. The first consortium, which is led by N4i Dr J. van der Vlag, will characterize the structure and function of the glomerular endothelial glycocalyx and find new biomarkers for assessing glycocalyx damage and disease stage. The aim of the second consortium, with N4i Prof. L Hilbrands and Prof. I. Joosten as work package leaders, is to further improve the results of renal transplantation by unravelling the interplay between viral infections, the allo-immune response and the effects that currently used immunosuppressive drugs have on this interplay.

Dr A. Warris, Dr M. van der Flier and Dr D. Burger received a grant from the ZonMw programme Priority Medicines for children for their proposal 'A new paediatric formulation of valacyclovir for the prophylaxis and treatment of VZV and HSV infections in children'.

Dr T. Radstake received, amongst others, a research grant from European League Against Rheumatism (EULAR) for a project on 'The identification of molecular targets in Systemic Sclerosis: Exploiting the full spectrum of functional genomics'.

Dr L. Joosten received a Pre-seed grant for the commercial exploitation of research results for his research project on developing a potent natural TLR4 antagonist as a new therapeutic drug for treating rheumatoid arthritis.

Dr B. Ferwerda received a Rubicon grant which provides newly graduated researchers the opportunity to gain experience in a foreign institute (University of Pennsylvania) for two years and Dr E. Snelders has received a Frye Stipendium, which is awarded to very promising female PhD students and aimed to stimulate them to proceed with a career in scientific research. Dr. T. Sprong received an award from the European Society of Clinical Microbiology and Infectious Diseases for his project on the clinical relevance of complement evasion strategies by *Staphylococcus aureus*.

M. Kouwenberg MSc received a ZonMw AGIKO clinical research grant for the project 'Increasing the tolerogenic potential of dendritic cells by targeted interference with chemokine function' (supervisor Prof. L. Hilbrands). Another ZonMw grant was obtained by E. Bijker MSc for translational malaria research and Dr A. Scholzen received a grant for an EMBO project.

Two PhD projects were funded: one led by Prof. J. Schalkwijk, Prof. I. Joosten and Dr P. Zeeuwen (Development and application of reconstructed skin models: functional analysis of major genetic risk factors for psoriasis) and the other led by Prof. A. van der Ven and Dr F. van Kuppeveld (Platelet-endothelial cell interactions in severe dengue virus infections).

The 2010 N4i awards went to Prof. R. Sauerwein for his outstanding achievements in the field of malaria research and to Dr T. Sprong for the best thesis of 2009: 'Meningococcal disease'.

Several N4i researchers were honoured for their scientific output. Prof. R. Sauerwein (Eijkman medal), Prof. J. van der Meer (Silver Radboud medal), Dr R. van Rij (Kluyver award), Dr F. van de Veerdonk (ECCMID and NIV award and Dutch representative at the Lindau meeting of Nobel laureates), Dr S. Heemskerk and Dr A. Rops (Kolff award) and Dr C. Bleeker-Rovers (Bronze Radboud medal).

### Research results

A major discovery by the group led by Prof. M. Netea and Prof. J. van der Meer was the finding that inflammasome-mediated caspase-1 activation controls adipocyte differentiation and insulin sensitivity. Treatment of obese mice *in vivo* with a caspase-1 inhibitor significantly increased their insulin sensitivity. This suggests that caspase-1 inhibition may represent a novel therapeutic target in clinical conditions associated with obesity and insulin resistance. (Stienstra *et al.*, *Cell Metab.* 2010 Dec 1;12(6):593-605).

The presence of the xenotropic murine leukaemia virus-related virus (XMRV) has been reported in peripheral blood mononuclear cells of patients with chronic fatigue syndrome. Considering the potentially great medical and societal relevance of such a discovery, Dr F. van Kuppeveld *et al.* investigated whether this finding could be confirmed. In an independent Dutch cohort study of patients with chronic fatigue syndrome XMRV was not found to be present. These results cast doubt on the claim that XMRV is associated with chronic fatigue syndrome in most patients. (Van Kuppeveld *et al.*, *BMJ.* 2010 Feb 25;340).

In a large collaboration study Prof. J. Schalkwijk, Dr P. Zeeuwen and collaborators performed a genome-wide association study and identified new psoriasis susceptibility loci and an interaction between HLA-C and ERAP1. They showed that ERAP1 variants only influence psoriasis susceptibility in individuals carrying the HLA-C risk allele. Their findings indicate that there may be pathways that integrate epidermal barrier dysfunction with innate and adaptive immune dysregulation in psoriasis pathogenesis. (Strange *et al.*, *Nat Genet.* 2010 Nov; 42(11):985-90).

Another large collaboration study was performed by Dr T. Radstake, Prof. P. van Riel and collaborators. They performed the first large genome-wide association study of Systemic Sclerosis and identified CD247 as a new susceptibility locus for this debilitating and potentially lethal disease. These findings support the strong autoimmune component underlying SSc pathogenesis and highlight the fact that the development of SSc seems to be determined by common genetic and pathogenic mechanisms that are shared with other autoimmune diseases. (Radstake *et al.*, *Nat Genet.* 2010, 42:426-429).

# Nijmegen Institute for Infection, Inflammation and Immunity

## Key publications

Davila, S., Wright, V.J., Khor, C.C., Sim, K.S., Binder, A., Breunis, W.B., Inwald, D., Nadel, S., Betts, H., Carroll, E.D., Groot, R. de, Hermans, P.W.M., Hazelzet, J., Emonts, M., Lim, C.C., Kuijpers, T.W., Martinon-Torres, F., Salas, A., Zenz, W., Levin, M. & Hibberd, M.L. (2010). Genome-wide association study identifies variants in the CFH region associated with host susceptibility to meningococcal disease. *Nature Genetics*, 42(9), 772-6.

Dinarello, C.A. (2010). Anti-inflammatory Agents: Present and Future. *Cell*, 140(6), 935-50.

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Griffiths, C.E., Strober, B.E., Kerkhof, P.C.M. van de, Ho, V., Fidelus-Gort, R., Yeilding, N., Guzzo, C., Xia, Y., Zhou, B., Li, S., Dooley, L.T., Goldstein, N.H. & Menter, A. (2010). Comparison of ustekinumab and etanercept for moderate-to-severe psoriasis. *New England Journal of Medicine*, 362(2), 118-28.

Hulscher, M.E.J.L., Grol, R.P.T.M. & Meer, J.W.M. van der (2010). Antibiotic prescribing in hospitals: a social and behavioural scientific approach. *Lancet Infectious Diseases*, 10(3), 167-75.

Kuppeveld, F.J.M. van, Jong, A.S. de, Lanke, K.H.W., Verhaegh, G.W.C.T., Melchers, W.J.G., Swanink, C.M.A., Bleijenberg, G., Netea, M.G., Galama, J.M.D. & Meer, J.W.M. van der (2010). Prevalence of xenotropic murine leukaemia virus-related virus in patients with chronic fatigue syndrome in the Netherlands: retrospective analysis of samples from an established cohort. *British Medical Journal*, 340, c1018.

Meer, J.W.M. van der & Simon, A. (2010). Blocking IL-1beta to slow down progression of ALS? *Proc Natl Acad Sci U S A*, 107(29), 12741-2.

Mulenga, V., Cook, A., Walker, A.S., Kabamba, D., Chijoka, C., Ferrier, A., Kalengo, C., Kityo, C., Kankasa, C., Burger, D., Thomason, M., Chintu, C. & Gibb, D.M. (2010). Strategies for nevirapine initiation in HIV-infected children taking pediatric fixed-dose combination "baby pills" in Zambia: a randomized controlled trial. *Clinical Infectious Diseases*, 51(9), 1081-9.

Netea, M.G. & Joosten, L.A.B. (2010). A NOD for autophagy. *Nature Medicine*, 16(1), 28-30.

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Stahl, E.A., et al. (2010). Genome-wide association study meta-analysis identifies seven new rheumatoid arthritis risk loci. *Nature Genetics*, 42(6), 508-14.

Stienstra, R., Joosten, L.A.B., Koenen, T., Tits, B. van, Diepen, J.A. van, Berg, Sanne van den, Rensen, P.C., Voshol, P.J., Fantuzzi, G., Hijmans, A., Kersten, S., Muller, M., Berg, W.B. van den, Rooijen, N. van, Wabitsch, M., Kullberg, B.J., Meer, J.W.M. van der, Kanneganti, T., Tack, C.J.J. & Netea, M.G. (2010). The inflammasome-mediated caspase-1 activation controls adipocyte differentiation and insulin sensitivity. *Cell Metabolism*, 12(6), 593-605.

Veerdonk, F.L. van de, Smeekens, S.P., Joosten, L.A.B., Kullberg, B.J., Dinarello, C.A., Meer, J.W.M. van der & Netea, M.G. (2010). Reactive oxygen species-independent activation of the IL-1beta inflammasome in cells from patients with chronic granulomatous disease. *Proceedings of the National Academy of Science of the United States of America*, 107(7), 3030-3.

Dissertations:	30
Scientific publications:	555
Patents:	6

## Director: Prof. Jos van der Meer

Jos van der Meer studied internal medicine and infectious diseases in Leiden. After being appointed as Professor in Internal Medicine at Nijmegen in 1988, he became Head of the Department of General Internal Medicine and head of the specialty training programme for Internal Medicine in 1992. He is a member of the Royal Netherlands Academy of Sciences and became Vice-president and Chairman of the Department of Natural Sciences in 2005.



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An important advance was made in understanding endosomal signalling pathways and their contribution to various biological responses. In collaboration with others Prof. I. Joosten identified the sequential requirement for DNA-PKcs, Akt, and NF-kappaB in signalling by CD158d. This delineates a previously uncharacterized endosomal signalling pathway for a pro-inflammatory response in NK cells. (Rajagopalan *et al.*, *Science Signal.* 2010 Feb 23;3(110).

Prof. M. Netea's group achieved an important breakthrough in understanding reactive oxygen species-independent activation of the IL-1beta inflammasome in cells from patients with chronic granulomatous disease (CGD). Inconsistent with the generally held belief that oxygen radicals are inflammatory, the findings of Netea's group support the concept that these radicals actually dampen inflammasome activation. The absence of oxygen radicals in CGD monocytes may explain the presence of an inflammatory phenotype characterized by granulomas and inflammatory bowel disease occurring in these patients. (Van de Veerdonk *et al.*, *Proc Natl Acad Sci USA.* 2010 Feb 16; 107(7):3030-3).

## Societal impact

Infectious diseases are the main reason for morbidity and mortality around the world and the focus of many aspects of the research programme, such as poverty-related infection. Inflammation and immunity not only underlie infectious diseases but also play a major role in other diseases that are studied within the framework of N4i. Researchers are actively involved in national and international organizations such as the KNAW, the Young Academy of the KNAW, Academia Europaea, European Academic Scientific Advisory Council (EASAC), Health Council of the Netherlands, the Centre for Infectious Disease Control (CIb at RIVM), ZonMw committees, the European and Developing Countries Clinical Trial Partnership, Dutch Working Party on Antibiotic Policy (SWAB), ESCMID, the Dutch Working Party on SLE and several other professional societies. Several N4i symposia were organized in 2010, including 'Q fever: the way ahead'.

tious Disease Control (CIb at RIVM), ZonMw committees, the European and Developing Countries Clinical Trial Partnership, Dutch Working Party on Antibiotic Policy (SWAB), ESCMID, the Dutch Working Party on SLE and several other professional societies. Several N4i symposia were organized in 2010, including 'Q fever: the way ahead'.

## Future research

By bringing together researchers to work on infection, inflammation and immunity, the critical mass for research in these fields increased considerably in 2010. N4i provides a platform for cross-fertilization in multidisciplinary research.

Areas for collaborative research in future include:

- The role of pattern recognition and inflammasome activation in infection and inflammation disorders
- Natural immunity to infection in human evolution
- Resistance to antifungal drugs and the implications for clinical medicine
- Exploring the pathophysiology of major pathogens (pneumococci, staphylococci, malaria parasites among others) and developing vaccines
- Modulating inflammatory and immunological responses using humoral and cellular tools (e.g. regulatory T cells)
- Exploring the role of epithelial barriers in disease (e.g. Psoriasis and atopic mucosal damage)
- Exploring the correlates of protection in poverty-related infections
- The role of apoptosis-induced auto-antigen modifications in the initiation of autoimmunity.

# Nijmegen Centre for Evidence-Based Practice

Every discovery in medical science should ultimately be applied in clinical practice. How such a discovery finds a way into clinical practice, however, is a science in itself. And that is exactly the field of research the NCEBP specializes in. Three questions are central to this research: Are the findings resulting from laboratory research or laboratory animal research also applicable to human patients? Does applying them lead to a reduction in sickness or mortality? And if so, how do you introduce them as a structural part of the daily activities of medics, allied health-care workers and nurses? These are the questions that are being asked in the fight against serious diseases such as cancer, chronic pulmonary disease, cardiovascular disease and dementia.



The NCEBP conducts research that is designed to help individual patients and patient populations, and in a preventative sense also healthy populations. The NCEBP is often involved in the development and evaluation of guidelines and protocols, both nationally and internationally. But the NCEBP is also involved in a broader sense, in all manner of policy issues relating to healthcare, thus bridging the gap between science and society.

The NCEBP comprises four closely interrelated research programmes. Each programme consists of 3 to 4 research themes. The programmes and themes are listed below.

#### *Epidemiology and evaluation*

- Molecular epidemiology
- Evaluation of complex medical interventions
- Infectious diseases and international health

#### *Clinical research*

- Human reproduction
- Human movement
- Cardiovascular research

#### *Patient-centred interventions*

- Effective primary care and public health
- Psychological determinants of chronic illness
- Mental health
- Nijmegen Alzheimer Centre

#### *Quality of clinical practice*

- Implementation science
- Quality of hospital and integrated care
- Quality of nursing and allied healthcare
- Healthcare ethics

## Staff

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 Prof. S.J. Berge (o)  
 Prof. J.J. van Binsbergen (o)  
 Prof. G. Bleijenberg (o)  
 Prof. B.R. Bloem (o)  
 Prof. G.F. Borm (o)  
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 Prof. G.J. Truin (o)  
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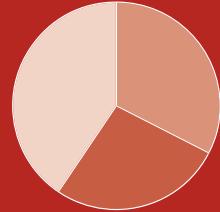
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 Prof. A.L.M. Verbeek (o)  
 Prof. N.J.J. Verdonschot (p)  
 Prof. F.W.A. Verheugt (o)  
 Prof. M.J.F.J. Vernooij-Dassen (o)  
 Prof. M.E. Vierhout (o)  
 Prof. K.C.P. Vissers (o)  
 Prof. C. van Weel (o)  
 Prof. G.J. van der Wilt (o)  
 Prof. J.A. Witjes (o)  
 Prof. J.R.L.M. Wolf (o)  
 Prof. G.A. Zielhuis (o)

## Tenured

Full Professors	21.8 FTE
Associate Professors	6.9 FTE
Assistant Professors	21.4 FTE
Researchers	39.4 FTE

## Non-tenured

Researchers	99.4 FTE
Doctoral candidates	110.2 FTE



■ FTE 1<sup>st</sup>  
 ■ FTE 2<sup>nd</sup>  
 ■ FTE 3<sup>rd</sup>

### Molecular epidemiology (Prof. Bart Kiemer)

Epidemiology is usually understood to involve studying lifestyle as a risk factor for disease, but the scope of the discipline is actually much broader. In the theme 'Molecular epidemiology', the main focus is on identifying molecular/metabolic and genetic determinants for disease and disease outcome. Most of the research targets various types of cancer, but other multifactorial diseases, *e.g.* autoimmune diseases and iron metabolism disorders, are studied where there are overlapping specific mechanistic pathways (*e.g.* the 1-carbon metabolism) or overlapping research methodologies (*e.g.* whole genome genetic association analyses). Aetiological issues are covered, but also issues related to diagnostic, prognostic and intervention research.

### Evaluation of complex medical interventions (Prof. Gert Jan van der Wilt)

Healthcare interventions may be complex in various ways. They may be technically complex, demanding considerable delivery skills. They may comprise multiple components (including contextual factors), each contributing critically to achieving the desired endpoint. Finally, they may be complex in terms of their effects, which can be multiple and varied, difficult to measure, and differentially distributed over time. These types of complexity pose considerable challenges to the valid evaluation of healthcare interventions. Within this theme methodologies are developed and tested that are appropriate when evaluating complex interventions.

### Infectious diseases and international health (Dr. Rob Baltussen)

The main goal within this theme is to improve health in both low and high income countries by developing an evidence base for

# Nijmegen Centre for Evidence-Based Practice



Prof. Chris van Weel (Full Professor) – an expert in primary care – is involved in developing the innovative e-Health system *Health Bridge*, which enables general practitioners and patients to consult hospital specialists directly via internet. See picture p. 98.



decision-making. The research activities are integrated, combining clinical, public health and economic disciplines whereby basic research in the Netherlands is often combined with translational research, including working in other countries. Research activities focus on 1) poverty-related diseases, 2) public health and health systems in developing countries, and 3) general infectious diseases, while at the same time building capacity designed to establish centres of excellence in certain low-income countries.

#### *Human reproduction (Prof. Jan Kremer)*

Human reproduction is a research topic that is booming, due to the increase in demand, growing awareness of prevention, diagnostic and therapeutic possibilities, and available evidence. Patients and society keep track of these developments and have relevant questions about the aetiology and prevention of reproductive and developmental disorders, as well as about the safety, effectiveness, and patient-centeredness of reproductive and obstetric care. This research theme is designed to provide answers to these questions.

#### *Human movement and fatigue (Prof. Sander Geurts)*

Many neurological, orthopaedic and oncological diseases affect movement ability and physical fitness and may cause excessive fatigue. Through analyzing biomechanics, motor control and physical activity as well as their interaction with cognition and emotion, this research is designed to disentangle the generic determinants from disease-specific determinants of musculoskeletal impairments, movement disability, reduced physical fitness and fatigue. Both mechanistic and clinical research questions are addressed. In this way, functional assessment, technological interventions and

rehabilitation strategies can be improved for many conditions, resulting in a better perception of health and quality of life.

#### *Cardiovascular diseases (Dr Gerard Rongen)*

The main aim within this theme to achieve greater understanding of the pathogenesis of cardiovascular disease in order to improve evidence-based cardiovascular healthcare and to train young talented investigators in cardiovascular research. The focus is on the mechanisms and consequences of vascular injury. This theme covers the first two steps of translating fundamental research into clinical practice. This involves human *in vivo* proof-of-concept studies and studies from concept to evidence-based medicine. The genetic and metabolic causes of atherosclerosis and thrombosis – and of their risk factors – are investigated. Regulation of vascular tone in health and disease is an important research topic.

#### *Effective primary care and public health (Prof. Chris van Weel)*

This research theme was established to support healthcare in the primary care population. The main challenges are promoting and preserving the health and functioning of ageing populations. Healthcare must be provided for all patient groups in the community (regardless of health problems, gender, and age or social class) while combining a variety of approaches: health promotion, disease prevention, diagnosing and treating diseases, rehabilitation, supporting patients and palliative care.

#### *Psychological determinants of chronic illness (Dr Andrea Evers)*

The focus of research here is on improving diagnostics and the treatment of patients with chronic somatic illnesses, in particular

with regard to the psychological determinants and consequences of somatic conditions. There are two linked sections: 'Psychological factors in chronic somatic illnesses' and 'Cognitive dysfunction'. Both focus on the psychological and neuro-psychological risk factors, consequences, diagnostics and treatments of these conditions in adults and children, finally contributing to improving the quality of care for those suffering from these conditions.

#### *Mental health (Prof. Anne Speckens)*

The aim of this research is to study the determinants, prevalence, prognostic significance and treatment of mental health problems from a patient-centred perspective. The theme focuses in particular on mood disorders, somatoform disorders, partner violence, Attention Deficit/Hyperactivity Disorder (ADHD) and Autistic Spectrum Disorders (ASD). Many projects involve a developmental perspective and the study of the precursors, longitudinal course, and age-related manifestations of these disorders. In addition, the implementation, effectiveness and cost-effectiveness of innovative therapeutic interventions are studied.

#### *Nijmegen Alzheimer Centre (Prof. Myrra Vernooij-Dassen)*

The Nijmegen Alzheimer Centre (NAC) focuses on developing and evaluating support programmes in order to directly improve the quality of care and quality of life for people with dementia, as well as for their families. Efficiency studies of these programmes are carried out to contribute to high-quality care at an affordable price. In addition, NAC contributes to fundamental knowledge on Alzheimer's disease.

#### *Implementation science (Prof. Michel Wensing)*

This theme focuses on improving healthcare practice, with a specific focus on primary care. It includes developing and evaluating performance indicators, interventions to achieve sustainable change, and the factors associated with changes in performance. Research fields include the education of health professionals, pharmaceutical patient care, out-of-hours care, structured chronic care and patient safety.

#### *Quality of hospital and integrated care (Dr Hub Wollersheim)*

Research within this theme is designed to measure and improve the quality and safety of patient care in hospitals, home care and nursing homes. In addition, handovers between these three settings or handovers with general practice are studied. Research covers clinical patient care across a wide range of diseases. It involves developing and evaluating quality indicators and effective implementation strategies, including integrated care systems.

#### *Healthcare ethics (Prof. Evert van Leeuwen)*

Healthcare ethics involves studying the ethical aspects of change processes. On a philosophical level, a conceptual analysis is made of theories and concepts that underlie the processes of change. Together these studies make it possible to evaluate existing care

in the light of changing norms and values, and they contribute to improving decision-making and the quality of care.

#### *Quality of nursing and allied healthcare (Prof. Theo van Achterberg)*

Research on nursing and allied healthcare sciences is a relatively young field. Challenges include searching for scientific evidence to support clinical practice and professional development. While medical care focuses on the aetiology, diagnostics and treatment of diseases and their cure, nursing and associated healthcare focus on disease prevention and the consequences of illness and disease for functioning, activities and participation.

### **Awards and acknowledgements**

- Anne Grotenhuis MSc received the René Vogels Travel Scholarship.
- Prof. Ellen Kampman received the Alpe d'HuZes professorship award.
- Prof. Michel Wensing was appointed Privat-Dozent at Heidelberg University (Habilitation), Germany 2010 (subject: Medical Care Research).
- Dr Pauline Aarts received the Kinderfonds Adriaanstichting award for her PhD project '*Modified constraint-induced movement therapy for children with unilateral spastic cerebral palsy: the Pirate group intervention*'.
- Dr Imelda de Groot received the Parents Project award for her work in children with Duchenne Muscular Dystrophy (DMD).
- The digital outpatient clinic on fertility (Digitale IVF poli) received a communication award from the Dutch journal 'Medisch Contact'.
- Prof. Chris van Weel was appointed Honorary Life Member of the World Organization of Family Doctors (WONCA).

### **Research facilities**

Databases, ICT networks, registries and clinical research facilities are crucial to research involving clinical and population studies. The most important facilities are listed below.

- Academic networks of general practitioner sites, nursing homes, municipality health services and dental care sites. Registries relate in particular to COPD and asthma, cancer, Parkinson's disease, Prader Willi Syndrome and patients with neuromuscular diseases.
- Innovative ICT applications designs (E-health, E-coach, Radquest) to improve patient care in Parkinson's disease, people with psychological disorders and *in vitro* fertilisation.
- Databases and biobanks of general population samples (The Nijmegen Biomedical Study), or of specific patient groups, *e.g.* congenital malformations, cancer (Comprehensive Cancer Center East, IKO) and poverty-related infections in Indonesia and Tanzania.
- The NCEBP has access to a clinical research centre comprising a wide variety of human *in vivo* models that can be used for "proof-of-concept-studies" (translational research), a research

# Nijmegen Centre for Evidence-Based Practice

## Key publications

Aarts, P.B.M., Jongerius, P.H., Geerdink, Y.A., Limbeek, J. van & Geurts, A.C.H. (2010). Effectiveness of modified constraint-induced movement therapy in children with unilateral spastic cerebral palsy: a randomized controlled trial. *Neurorehabilitation and Neural Repair*, 24(6), 509-18.

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Dissertations:	54
Scientific publications:	1137
Patents:	2

laboratory for toxicological biomarker development and validation and a consultation facility for statistical genetics.

- A multidirectional balance perturbation platform the 'Radboud Falls Simulator', officially opened in 2010, is used to study human postural control at the limits of stability. This platform is unique worldwide.
- An innovative approach to health care innovation, the 'Koploper program', is started in which professionals in primary care, public health and the hospital jointly develop new approaches to care. Central themes are the *promotion of prevention*, the *linking of health care and wellbeing*, and *networking professionals*. Information technology ('health bridge') provides important support.
- The Minimal Invasive Technology expert Centre (MITeC) (in collaboration with the Twente University) for evaluation of innovations (evidence-based medicine trials, health technology assessment).

## Collaboration

- Twelve regional hospitals collaborate in DREAM (Dutch Rheumatoid Arthritis Monitoring) to stimulate clinical research and quality of care, in particular pharmacotherapy, in patients with rheumatoid arthritis. The Radboud University Nijmegen Medical Centre and Twente University are the leading centres.
- For Oncology research, the NCEBP collaborates with the Comprehensive Cancer Centre East (IKO) in Nijmegen. Further, the NCEBP collaborates with the Foundation for the Detection of Hereditary Tumours (StOET) in Leiden and the National Expert and Training Centre for Breast Cancer Screening in Nijmegen,
- Within the fields of primary care and public health, the NCEBP is engaged in intensive collaboration with the Ministry of Health, Welfare and Sport, the National Institute for Public Health and the Environment (RIVM), and the National Health Services Research Centre (NIVEL).
- The Consortium Mental Retardation ('Consortium VG Oost Nederland'): Institutes for the Mentally Retarded.
- Partner in the national biobank initiative (String of Pearls Initiative, PSI) of the Dutch Federation of University Medical Centres (NFU), set up to create a research infrastructure for future studies on eight selected diseases.

The NCEBP collaborates with university centres all over the world (IRUN partners: the Universities of Münster and Leuven), but also with the European Union/ECDC, the World Health Organization, UNESCO, the Center on Birth Defects and Developmental Disabilities, a number of Centres for Disease Control and Prevention and deCODE Genetics in Reykjavik, Iceland. Promising topics include:

- Research on falls after stroke
- Computational and neurological modelling of speech motor control and disorders
- Understanding the genetic, physiological and psychological mechanisms underlying disabling medically unexplained symptoms and somatisation

# Nijmegen Centre for Evidence-Based Practice

- Psychological aspects of reproductive medicine
- Cultural diversity in health and healthcare.

## Research results

In 2010, a total of 54 PhD theses were successfully defended, five of which were of outstanding quality (*cum laude*):

- Dr Ingrid Desar: 'Advanced monitoring of targeted therapy in cancer'
- Dr Hein Janssens: 'Gout arthritis in general practice'
- Dr Eric Keus: 'Evidence -based clinical intervention research. Cholecystectomy for symptomatic cholezystolithiasis'
- Dr Joost van Middendorp: 'On the injuries of the vertebrae and spinal marrow: prognostic factors & classifications'
- Dr Loes Schouten, 'Quality improvement collaboratives. Cost-effectiveness and determinants of success'.

Over a thousand peer-reviewed papers were published by NCEBP researchers. Some highlights:

- For Lynch syndrome (hereditary nonpolyposis colorectal cancer) a new mechanism for identifying the genetic basis was identified, the Body Mass Index (BMI) was identified as an important risk factor for the occurrence – and recurrence – of this disease and evidence was found that a shorter time between the diagnosis of colorectal cancer and microsatellite instability testing is not associated with higher levels of distress, and that microsatellite instability testing for Lynch syndrome is not followed by high levels of psychological distress.
- Identification of a correlation between a gene-variant of TACC3 and bladder cancer opens up new prospects for research on the important role of the gene FGFR3 in bladder cancer prognosis.
- The AGORA research group discovered an important gene (DGKK) that is involved in the pathogenesis of hypospadias, a frequently occurring congenital malformation among boys.
- Evidence was found that tailored cognitive-behaviour therapy is effective for patients with fibromyalgia.
- A screening tool for measuring the risk of emotional problems during and after fertility treatment was validated, a screening tool for detecting problems in integral health status in COPD was developed and new diagnostic tools for assessing memory deficits and executive function in early-stage dementia were validated.
- Implementation research has increasingly focused on the functioning and effectiveness of patient care teams. A number of potential determinants of the implementation of research knowledge in routine healthcare delivery were identified. Most research results provide insight into how actual care can be assessed and how this knowledge can be used to fine tune healthcare improvement strategies, especially for frail patients with chronic diseases.
- In Indonesia and Tanzania, several projects on poverty-related infections (malaria, tuberculosis and HIV infections) were successfully set up.

- Within the field of cardiovascular diseases the NCEBP has finished several *in vivo* human studies on phaeochromocytoma, lipoprotein metabolism, the sympathetic nervous system, the renin-angiotensin-aldosterone system, and on ischemia-reperfusion injury.

## Societal impact

NCEBP researchers have made a significant contribution to national and international guidelines and reports of societal or scientific institutes and committees, such as the international Commonwealth, the RIVM, the Ministry of Public Health, Welfare and Sport, the Netherlands Organisation for Health Research and Development, the European Academy of Nursing Science, the WONCA, the National Expert Committee on Perinatal Mortality, the National Committee for the Modernization of Obstetric Care Indication list, the Dutch Society for Neurorehabilitation, the national Appraisal Committee hosted by the National Health Insurance Board, the Guideline Committee on Persistent Complaints after Q fever and the Guidelines International Network.

NCEBP researchers actively participated in scientific boards such as the Board of the Dutch Researchers Innovative Research Incentives scheme (Veni-Vidi-Vici), the Scientific Advisory Board of the Dutch Burns Foundation, the Board of the Dutch Association for Psychodermatology, the Netherlands Behavioural Medicine Foundation (chair), the Dutch Asthma Foundation, the Advisory Board of the Dutch Cancer Foundation, the scientific committee of the Dutch Brain Foundation and the Scientific Advisory Board of the European Joint Programming initiative for combating Neurodegenerative Diseases (JPND).

Some highlights reported in the media were:

- The launch of the project 'Patient safety for the general practitioner' in close collaboration with the Minister of Health (27 September - 3 October 2010).
- Active involvement in societal debates on 'social freezing of oocytes' and 'ethical doubts in reproductive treatment'.
- Prof. Anne Speckens contributed to the VPRO program Labyrinth in December 2010.
- The 2010 Pieter Boeke Lecture on Mindfulness on 8 November 2010 by Prof. Anne Speckens.
- The introduction of systematic reviews of laboratory animal research by the Radboud University 3R Centre. In establishing a new global charter to promote animal welfare, the association of research-based pharmaceutical companies in Switzerland, Interpharma, invited Prof. Merel Ritskes to present her work on the role of systematic reviews in laboratory animal research.
- An international symposium: 'To fight or flight: Avoidance and persistence in chronic pain'. Radboud University Nijmegen Medical Centre, 17 December 2010.

## Director: Prof. Paul Smits

Paul Smits, who trained as an Internist at Radboud University Nijmegen Medical Centre, is registered as a pharmacologist and a clinical pharmacologist. He has been a Full Professor of Pharmacology at Radboud University Nijmegen since 1995. In 1994 he was a visiting scientist at Harvard Medical School, Boston, USA. His research interests are clinical and translational pharmacology and vascular medicine. As head of the Department of Pharmacology and Toxicology, he combines clinical work with education and research.



## Nijmegen Centre for Evidence-Based Practice

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## Future research

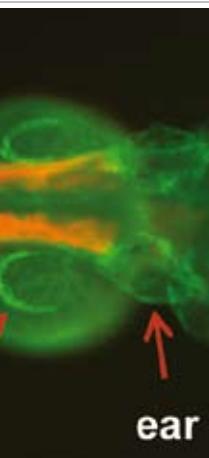
Important grants awarded to NCEBP researchers in 2010 provide a solid basis for future research. In 2010, there were four grants from the European Union:

- An EU 7<sup>th</sup> Framework Programme grant was received to study pharmacogenetics of metastasized renal cell cancer (Prof. Bart Kiemeneij). With this project, a new research line in the field of pharmacogenetics of cancer – EuroTARGET – will be started. This is a European collaborative project on targeted therapy in renal cell cancer that will assess genetic and tumour-related biomarkers for response and toxicity.
- An EU 7<sup>th</sup> framework project on tailored implementation in chronic illness care was awarded to Prof. Michel Wensing.
- Dr Vivian Weerdesteyn and Prof. Alexander Geurts, together with the department of Orthopaedics (Prof. Nico Verdonschot), started the TLEM safe project on testing the validity of the Twente Lower Extremity Model (TLEM) for reconstructive neuro-orthopaedic surgery (EU 7<sup>th</sup> Framework Programme).
- An EU 7<sup>th</sup> Framework Programme grant was awarded to Prof. Myrra Vernooij-Dassen, and Dr Yvonne Engels in close collaboration with the Department of Anaesthesiology, Pain and Palliative Medicine. The study is called IMPACT (IMplementation of quality indicators in PAlliative Care sTudy).
- Prof. Marcel Olde Rikkert received an EFRO grant to study the treatment of Alzheimer with tetrahydrocannabinoid.

Further, a wide range of grants were acquired by NCEBP researchers:

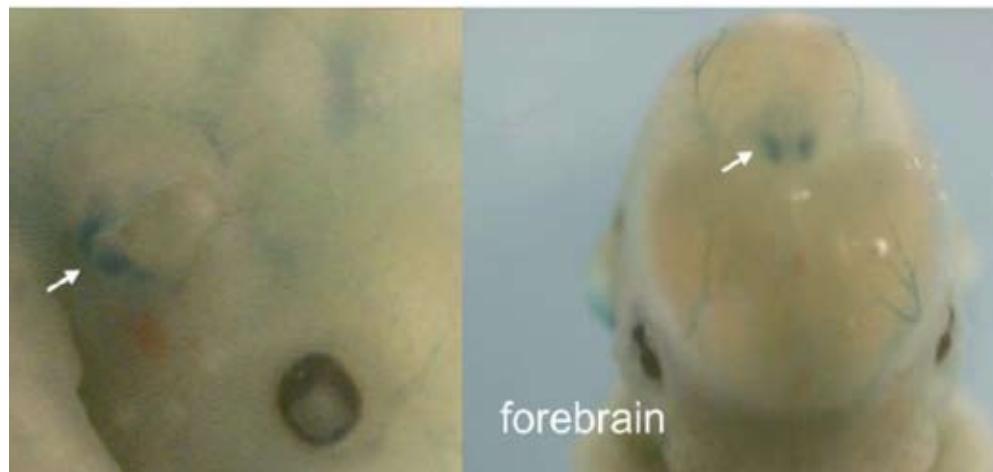
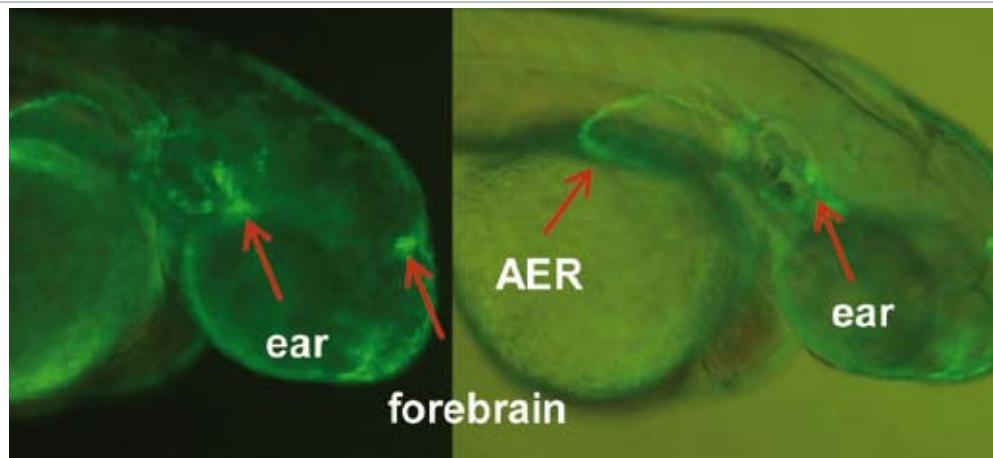
- Dr Sita H. Vermeulen received an NWO Rubicon grant to clarify the relationship between inflammation and urinary bladder cancer using multi-SNP analysis of genome-wide data.
- Dr Vivian Weerdesteyn received an NWO Veni grant to study '*Why stroke patients fall (and how to prevent them from falling)*'.
- Dr Toine van der Heijden received a KWF Fellowship to study biomarkers for the diagnosis and prognosis of bladder cancer.
- Ruben Cremers MSc received a ZonMw AGIKO Grant to study genetic prostate cancer variants as biomarkers of disease progression.
- A grant from the American Alzheimer Association was awarded to Dr Marcel Verbeek to study ApoE and ApoJ in the cerebrovascular clearance of amyloid beta protein.
- A multivariate analysis (Bayesian variable selection method), as part of an NWO Horizon breakthrough grant obtained by Dr Marieke Coenen, will also be used to identify genetic variants associated with autoimmune disease.
- With funding of the Foundation Alpe D'HuZes, a consortium of Radboud University Medical Centre, Wageningen University and Free University Amsterdam was started to enable collaborative research on the role of overweight in colorectal, breast and prostate cancer survival.
- Prof. Alexander Geurts and Prof. Luciano Fasotti received a ZonMw grant to start the *Restore-4-Stroke* project on the psychosocial consequences of stroke and the treatment of emotional disturbances.

# Nijmegen Centre for Molecular Life Sciences



*Understanding the cellular basis of disease*

The Nijmegen Centre for Molecular Life Sciences (NCMLS) seeks to achieve greater insight into the complexity of living cells in order to obtain comprehensive knowledge of both normal and pathological processes. NCMLS pursues its goals in the interests of curiosity-driven research and education. The NCMLS aims to advance innovation in translational research, based on integrating diverse areas of scientific expertise within the molecular and medical sciences.



The NCMLS – a leading multidisciplinary research school that is accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW) – operates within the domain of molecular mechanisms of disease and particularly in the fields of molecular medicine, cell biology and translational research. The NCMLS accommodates research groups from both the Radboud University Nijmegen Medical Centre (UMC St Radboud) and the Faculty of Science. Research takes place within three main themes, which reflect the Centre's mission to move towards understanding the cellular basis of disease. These are: 1) Infection, immunity & tissue regeneration; 2) Metabolism, transport & motion; and 3) Cell growth & differentiation.

*Topics within theme 1: Infection, immunity and tissue repair (Prof. G. Adema)*

Infection and autoimmunity (Prof. J. Schalkwijk), Immune regulation (Prof. G. Adema), and Regenerative medicine and molecular microenvironment (Dr A. van Kuppevelt)

The immune system has the dual task of eliminating pathogens and eradicating incipient tumours, while preventing auto-reactive responses harmful to the host. In maintaining this balance, there is a complex interplay between immune and tissue cells and the many stimulatory and inhibitory circuits that operate simultaneously. Outcomes are further shaped by genetic and environmental factors. Deregulation of this intricate balance is associated with human diseases ranging from inflammatory and autoimmune disorders to cancer, infection and transplantation disorders. In each case, prolonged deregulation can initiate a cascade of events, ultimately leading to tissue damage and destruction. The aim of tissue engineering research is to repair or replace damaged tissues by implanting 'smart' synthetic bio-matrices or stem cells. Immune control is intrinsically involved both in tissue acceptance and in preventing the attacks on engineered tissues.

A multidisciplinary approach is taken to defining the molecular basis of immune regulatory circuits, events that trigger or fuel immune-related disorders and infectious diseases, and tissue

## Staff

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 Prof. R.E. Brock (o)  
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 Prof. P. Buma (p)  
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 Prof. A. Heerschap (o)  
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 Prof. L.P.W.J. van den Heuvel (o)  
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 Prof. A.E. Rowan (p)  
 Prof. F.G.M. Russel (o)  
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 Prof. J.A. Schalken (p)  
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 Prof. R.J. Siezen (e)

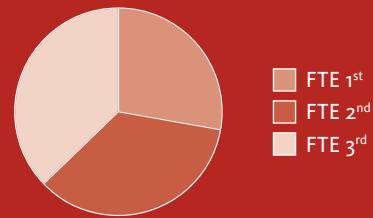
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 Prof. H.G. Stunnenberg (o)  
 Prof. P.E. Verweij (o)  
 Prof. J. de Vlieg (e)

### Tenured

Full Professors	29.2 FTE
Associate Professors	19.1 FTE
Assistant Professors	18.6 FTE
Researchers	16.0 FTE

### Non-tenured

Researchers	120.7 FTE
Doctoral candidates	166.4 FTE



pathology and regeneration as well as stem cell behaviour and differentiation.

#### Topics within theme 2: Metabolism, transport and motion

(Prof. B. Wieringa)

Energy and redox metabolism (Prof. B. Wieringa), Membrane transport and cell dynamics (Prof. R. Bindels)

The study of disease at the molecular level – but in the context of the multi-molecular world of cellular organelles, the intact cell, or organs and tissues in the entire organism – is central to ongoing work within Theme 2 of the NCMLS. Intrinsic genetic problems or extrinsic factors that cause cellular energy deprivation, ion and metabolite and water transport failure, toxic accumulation of metabolic intermediates, or ischemia and anoxia due to cerebro-vascular obstruction, underlie a broad range of diseases and conditions, including cancer, neuropathy and myopathy, degenerative disorders such as Alzheimer's and Parkinson, organ failure, exercise intolerance and fatigue, and renal tubulopathy and retinopathy.

In addition, for conditions such as obesity and type II diabetes, as well as certain aspects of ageing, it is well established that there is a direct link to metabolism, transport physiology and cell dynamics.

There are close links at many levels between the different topics studied within this theme. Metabolites such as ATP and NAD(P) (H) produced in key pathways such as glycolysis and mitochondrial respiration are consumed as fuel or needed as co-factors for ion-transport ATPases, drug-transporters and the acto-myosin motor and sliding machinery involved in organelle dynamics and cell movements. Forms of renal disease, cardiomyopathy, and brain and muscle disorders are caused by defects in the production or assembly of ATPases, water channels or the mitochondrial OXPHOS machinery. Often defects in metabolic signalling are also involved. Defects in the structure and/or functioning of cilia (hair-like protrusions on epithelial cells with signalling abilities) have recently been identified as important causes of renal disease, often in combination with blindness, deafness and brain disorders.

# Nijmegen Centre for Molecular Life Sciences



Prof. Hans van Bokhoven (Full Professor) coordinates the large-integrated systems biology project GENCODYS. This EU-financed project explores the relationship between genes and cognitive disorders, such as intellectual disabilities (mental retardation), autism and a variety of psychiatric conditions. Research in the Department of Genetics uses powerful model organisms, such as *Drosophila*, mice and zebrafish, to identify the key molecular and cellular mechanisms of normal and disrupted cognitive processes. See picture p. 106.



## Topics within theme 3: Cell growth and differentiation (Prof. H. van Bokhoven)

Genetic and epigenetic pathways of disease (Prof. H. van Bokhoven), Chemical and physical biology (Prof. J. van Hest)

The fate of all cells lies in the fine balance between growth and differentiation. If this balance is disturbed, uncontrolled growth and deregulated cellular development can lead to disease. Studying the processes that underlie growth and differentiation is pivotal to a basic understanding of the causes of many diseases and malfunctions.

Multi-level analysis is used to study the blueprint of all cellular decisions and a functional genomics approach is pursued that ranges from deciphering the genome in terms of actively transcribed genes under defined cellular circumstances (such as normal differentiation versus unregulated proliferation) to specific disease-linked genomic studies. Since the single cell cannot be viewed in isolation from its surroundings, decisions within the cell need to be linked to external cues and constraints, and the translation of this approach within cells is at the core of research on signalling networks. In order to understand the molecules that convey the information packaged in the functional genomic blueprint, as well as the signals from the cellular outside world, it is also necessary to achieve a better understanding of the protein structure and design of these molecules that finally convey the growth and differentiation decisions. Valuable insights can be gained from investigating a specific differentiation programme and neural development is studied as a special case.

## Awards and prizes

- Dr Karen Buysse obtained an EMBO long-term fellowship in order to perform post-doctoral research at the Molecular Genetics division of the Department of Human Genetics under supervision of Prof. Hans van Bokhoven
- Dr Jenny van der Wijst obtained an EMBO long-term fellowship in for a collaborative project between the MRC protein phosphorylation unit in Dundee (Prof. Dario Alessie) and the department of Physiology (Prof. Bindels and Prof. Hoenderop)
- Dr Anja Scholzen obtained an EMBO long-term fellowship in order to perform post-doctoral research at the Department of Medical Microbiology (Prof. Robert Sauerwein).
- Dr Steffi Lehmann received an EMBO long-term fellowship to perform *in vitro* and *in vivo* experiments on the effect of hypoxia regulation of cancer invasion and metastasis (Prof. Peter Friedl).
- Dr Emese Gazdag obtained an EMBO long-term fellowship in order to perform post-doctoral research at the Department of Molecular Biology (Dr Gert-Jan Veenstra).
- Dr Ronald van Rij (Department of Medical Microbiology) was awarded the Kluyver Award from the Netherlands Society for Microbiology (NVvM) in recognition of his outstanding contribution to microbiology.
- Dr Rob Collin of the Departments of Human Genetics and Ophthalmology received the Retina Netherlands Career Development Award 2010.
- Drs. Jessica Nouws was awarded the Tweelingprijs by the Dutch Society of Paediatrics on behalf of the Maarten Kappelle Foundation for the best fundamental article on paediatrics published in a scientific journal in the period 2009-2010.

## Research facilities

These are grouped in the following categories:

### Animal models

Medical research is ultimately about whether or not results can be applied effectively in humans. Animal models are therefore of great importance to molecular life scientists engaged in biomedical research. The NCMLS has excellent links to the Central Animal Facility (CDL), which provides expert advice and access to facilities for animal testing and has several disease-related models available, for example for arthritis, cancer, kidney disease, tissue engineering, heart transplantation, neural disorders, metabolic disorders, osteoporosis, haematopoiesis, fungal and bacterial septicaemia, and malaria (*P. falciparum*).

### Molecular imaging

Imaging at the sub-cellular and cellular level is an essential tool for molecular life scientists. The Microscopic Imaging Centre (MIC) at the NCMLS is a state-of-the-art facility for imaging biological specimens that uses light microscopy (bright-field, confocal and fluorescence), conventional scanning and transmission electron microscopy, as well as sophisticated digital imaging. The facility offers access to other techniques such as Atomic Force Microscopy Flow cytometry, FRET and FRAP. Access to magnetic resonance facilities for *in vivo* NMR and MRI of animals and humans (7 Tesla) are also available.

### Translational research (cellular therapy)

A GMP facility with clean rooms is available for innovative translational research projects. Current projects include immunotherapeutic cell therapy, stem cell transplantation and gene therapy. In 1997 the Departments of Tumour Immunology, Medical Oncology and Haematology collectively started applying dendritic cell-based anti-cancer vaccines in melanoma patients. To date, more than 250 patients have been treated with this experimental form of therapy.

### Genomics

DNA sequencing and micro-array technology for gene expression profiling are fast becoming standard laboratory tools. The Microarray Facility in Nijmegen is one of the core facilities of the Radboud University Medical Centre. The department also houses a sequencing facility and a genotyping facility. The Facility focuses on multiple applications such as expression profiling, genomic copy number profiling (array CGH) and high-density SNP profiling.

### Proteomics

The growing availability of genomic sequence information – together with improvements in protein characterization using mass spectrometry – has had an enormous impact on protein research. To exploit these opportunities the Nijmegen Proteomics Facility (NPF) was established in 2004. This state-of-the-art facility offers fundamental technological tools in proteomics research and makes them available

## Molecule-2-Man ([www.molecule2man.eu](http://www.molecule2man.eu))

The NCMLS is an active participant in Molecule-2-Man (M2M), an innovative multidisciplinary imaging platform strategically located at the University and UMC St Radboud, which both have a long history of interdisciplinary research, education and health-care. M2M is built on the strengths and proven track record of leading Nijmegen institutes in molecules and materials, molecular life-sciences, cognitive neuroscience and medical sciences. Its aim is to reinforce existing local and national infrastructures by concentrating expertise and facilities in order to create a top European health technology campus in Nijmegen, which will implement and advance imaging technologies from the molecular level to entire organs and the human body itself (*i.e.* from molecule to man) and take translational research from the laboratory into the clinic (from bench to bed). M2M provides the perfect platform for knowledge exchange, access to state-of-the art instrumentation. It also facilitates collaboration with research institutes, small and medium-sized enterprises and larger companies.

for academic and industrial researchers, both within and outside the Radboud University Medical Centre. Available equipment includes 2D-electrophoresis, SELDI-TOF and mass spectrometry (MALDI-TOF, MALDI-LTQ and nano-LC LTQ-FT MS).

### Bioinformatics

The Centre for Molecular and Biomolecular Informatics (CMBI), which is the Dutch National Centre for Computational Molecular Sciences, is housed on the ground floor of the NCMLS research tower. The Centre pursues a rigorous research programme, with topics ranging from computational small-molecule chemistry to bioinformatics. Its facilities, databases and software packages are available to external scientists and there is a help desk for those who use the service facility. Currently, the CMBI is primarily involved in bioinformatics research and in maintaining a data and software infrastructure to help scientists improve bioinformatics and/or computational small-molecule research.

### Collaboration

NCMLS researchers collaborate at the local, national and international level. The research school is allied with the Institute for Molecules and Materials (IMM) and the Donders Institute for Brain, Cognition and Behaviour (DI-BCB), providing a solid platform for integrating chemical synthesis, nanoscience and neuroscience with molecular life sciences. Furthermore, incorporating the Centre for Molecular and Biomolecular Informatics (CMBI) within the NCMLS has strengthened the multidisciplinary approach to solving biomedical research problems. The NCMLS houses the Netherlands Bioinformatics Centre (NBIC) which has as its mission to stimulate the development of bioinformatics in the Netherlands,

# Nijmegen Centre for Molecular Life Sciences

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Dissertations: 60  
Scientific publications: 704  
Patents: 3

further strengthening NCMLS links in bioinformatics. The NCMLS also has associations with the Dutch Programme for Tissue Engineering (DPTE) and the Netherlands Proteomics Centre. The NCMLS contributes to the Top-Institute Pharma, within which it has several academic and industrial partners in this context. In addition, the NCMLS is actively involved in national programmes such as the BioMedical Materials programme (BMM), Centre for Societal Genomics (CSG), Center for Translational and Molecular Medicine, Netherlands Genomics Initiative (NGI), and international multi-partner programmes such as EU FP6 and 7.

The 'Molecule to Man' platform (see inset) has great potential for advancing the early detection of disease and monitoring the treatment of disease states. Besides the NCMLS, the platform represents research groups from a number of other institutes and research groups. These include the Donders Institute for Brain, Cognition and Behaviour, the IMM, and clinical departments of the Radboud University Nijmegen Medical Centre.

### Selected research results

- More than €22 million was awarded by the EU for two European large-integrated systems biology projects to be coordinated by two researchers from the Department of Human Genetics. The GENCODYS project, which is coordinated by Hans van Bokhoven, explores the relationship between genes and cognitive disorders, such as intellectual disabilities (mental retardation), autism and a variety of psychiatric conditions. The SYSCILIA project (Dr Ronald Roepman) plans to create an advanced computer model of the molecular machinery of a small but essential part of the cell, the cilium.
- In the Centre for Systems Biology and Bioenergetics (CSBB) more than thirty-five research groups of the UMC St Radboud and the Radboud University are working together to develop an innovative computer model that can accurately predict energy metabolism. The CSBB received a grant from NWO and ZonMw for the initial development of in silico models that will integrate the available knowledge about the energy metabolism of the human muscle. This project is coordinated by Prof. Jan Smeitink (Department of Paediatrics).
- Prof. Peter Hermans (Department of Paediatrics) and Prof. Han Zuilhof (Wageningen University) have received a FES project grant to develop an electronic platform for high throughput and real-time detection of biomarkers for inflammation.
- Dr Frank van Kuppeveld (Department of Medical Microbiology) was awarded a grant for setting up a European Training Network on virus replication and antiviral drug development.
- The Dutch Kidney Foundation (DKF) awarded two grants to renal research consortia focusing on translational research. The first consortium will be led by Dr Johan van der Vlag (Department of Nephrology) and will study the structure and function of the glomerular endothelial glycocalyx. The purpose of the second consortium, which includes Prof. Luuk Hilbrands

# Nijmegen Centre for Molecular Life Sciences

(Department of Nephrology) and Prof. Irma Joosten (Department of Laboratory Medicine) is to further improve the results of renal transplantation.

- Dr Nael Nadif Kasri (Department of Cognitive Neuroscience, Molecular Neurogenetics Unit) was awarded a tenure track fellowship for establishing a research line on mental retardation.
- Dr Marcel Coolen (Department of Molecular Biology) was awarded a tenure track fellowship for establishing a research line on human epigenetics.
- A TOP subsidy (ZonMw) was awarded to Prof. Frans Cremers (Department of Human Genetics), Dr Hannie Kremer (Department of Otorhinolaryngology) and Dr Anneke den Hollander (Department of Ophthalmology). The project will use a genome-wide search for novel sensory disease genes using consanguineous and non-consanguineous families.
- Prof. Carl Figgdr, Dr Jack Fransen and Dr Joost te Riet received a grant from NWO and ZonMw for to purchase a combined Atomic Force/Confocal Microscope (25% of the funds will be matched by the UMC St Radboud). These NCMLS researchers will initially use this microscope to study 'mechanotransduction'.
- Prof. Robert Sauerwein (Department of Medical Microbiology) received a grant from the ZonMw translational research programme to investigate whether co-administration of immune-modulating drugs can empower malaria immunization strategies.
- Dr Timothy Radstake (Department of Rheumatology) was awarded a research grant from the European League Against Rheumatism (EULAR) in an international project designed to identify molecular targets in systemic sclerosis.
- Dr Tom Nijenhuis, clinical fellow in Nephrology and researcher at the Departments of Nephrology and Physiology, received a Ruby Diabetes Research Grant from the Dutch Diabetes Research Foundation to investigate the role of TRPC6 in the pathogenesis of diabetic nephropathy (DNP).

## Societal impact

NCMLS plays an important role in improving our understanding of the molecular mechanisms of disease. Various members and affiliated members are funded by national and international patient-oriented non-profit organizations, such as the Kidney Foundation, Dutch Cancer Society, the Diabetic Foundation, and the Rheumatoid Arthritis Foundation. In addition, several NCMLS members have advisory functions or are board members within these organizations. Clinical groups (led by Profs. Berden, Netea, Punt, de Witte, Knoers, Kullberg and Smeitink), interact on a daily basis with patients and their relatives at the Radboud University Medical Centre, have close ties with patient organizations and are involved in public and strategic policy.

Starting in 2007, the Nijmegen Centre for Molecular Life Sciences (NCMLS) institute has organised a yearly international 'New Frontiers' symposium. The theme of each symposium covers a specific topic within one of thematic areas of NCMLS. This year's

symposium, entitled 'Bioenergetics: live and let die', was held on 16 and 17 November 2010, attracting visitors to the institute from across Europe, Asia and America. In total more than 300 people attended both days of the symposium. This years' symposium was organized in collaboration with the Institute for Genetic and Metabolic Diseases.

The societal importance of Molecular Life Sciences-related research is emphasized in the NCMLS graduate education programmes (both MMD and PhD) and throughout the research school. Researchers at the NCMLS study molecular mechanisms that control essential functions of the cell and explore ways in which malfunctioning can lead to life-threatening disorders. Training researchers in this field is of great importance to society, since they will form the new generation of scientists and biotechnology entrepreneurs, who will continue the search for new drugs and develop novel treatments. In addition, when NCMLS researchers continue their careers in public, political or government positions, they will be equipped to inform the general public and have the communication skills needed to explain complicated scientific matters in layman's terms.

## Future research

The following Veni, Vidi and Vici grants (NWO), as well as Horizon grants (ZonMW), which were awarded to members of NCMLS, form the basis for important future research.

- Prof. Mihai Netea (Dept. of Internal Medicine) received a Vici award for the study of immunological memory (2009 round, announced early in 2010).
- Prof. Peter Friedl (Dept. of Cell Biology) received a Vici award for research on cancer invasion and metastasis.
- Jan van Hest (IMM) received a Vici award for research on the construction of hybrid polymer systems.
- Prof. Hans Spelbrink (Dept. of Paediatrics) received a Vici award for the study of mtDNA nucleoids.
- Dr Joost Martens (Dept. of Molecular Biology) received a VIDI award for the study of heritable epimutations.
- Dr Mangala Srinivas (Dept. of Tumour Immunology) received a Veni award for developing novel cell therapy imaging tools.
- Dr Bas Dutilh (CMBI) received a Veni award for the computational analysis of symbiosis.
- Dr Rutger Vogel (Dept. of Paediatrics) received a Veni award for research on tumour invasion and metastasis.
- Dr Ronald van Rij, (Department of Medical Microbiology) received a Horizon award for 'Functional genomics of antiviral defence in insects'.
- Dr Richárd Bartfai (Department of Molecular Biology) received a Horizon award for 'Massive parallel sequencing for extreme genomes'.
- Dr Ulrike Jacobi (Department of Molecular Biology) received a Horizon award for 'A promoter resource to study the effect of genome duplication on regulatory sequences'.

## Director: Prof. René Bindels

René Bindels – a Full Professor of Physiology – has been Head of the Department of Physiology since 2003. His research area is the regulation of ion transport processes in kidney and intestine (in health and disease) and he specializes in renal TRP channels and salt transporters. Prof. Bindels is an elected member of the Academia Europaea and a recipient of the Robert Pitts Lectureship of the International Union of Physiological Sciences, the Carl W. Gotschalk Lectureship of the American Physiological Society and the Homer Smith award of the American Society of Nephrology.



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- Dr Margit Schraders (Department of Otorhinolaryngology) received a Horizon award for 'The state-of-the art technology of next generation sequencing to identify the genes causing hereditary hearing loss'.

*Developments in theme 1: Infection, Immunity and Tissue Repair*  
Future fundamental research will focus on the role of dendritic cells, regulatory T-cells and other haematopoietic cells in adaptive immunity, as well as the contribution of resident tissue-specific cells (e.g. epithelial cells, synovial cells and chondrocytes) in innate immune processes. Current knowledge about these cell types and developments in stem cells will help us redefine and expand our knowledge of cellular regulatory circuits and differentiation routes. In addition to developing and applying novel tools for diagnosis and tissue pathology, the knowledge is gained will lead to new experimental treatments.

*Developments in theme 2: Metabolism, transport and motion*  
New opportunities will allow further integration of novel microscopy-imaging platforms and MR tools into experimental in vitro and in vivo studies, the development of biosensors or cell lines for screening and diagnostic purposes, the development of a new methodology for modulating cell processes by chemical rather than biological means, and new high-content diagnostic methods for characterising cellular metabolic-physiological states. Patients with metabolic or genetic diseases such as muscle, neurological disorders and kidney problems will ultimately benefit from the availability of new procedures for preventing disease and novel agents that can help stabilize or enhance their health.

## *Developments in theme 3: Cell growth and differentiation*

The range of research activities in Functional Genomics, has resulted in the development of novel diagnostic tools such as DNA micro-arrays, software development and improved recognition of hereditary cancer syndromes. Other new tools of great general interest such as ChIP-seq will be widely implemented to explore disease, the aetiology and functional consequences of key nuclear factors. Research will also continue to exploit the potential of organic chemistry to modify, design and mimic proteins and their building blocks in order to modulate and analyze their activities and properties in the cellular environment.

# Institute for Water and Wetland Research



The Institute for Water and Wetland Research (IWWR) encourages interdisciplinary cooperation between scientists engaged in microbiology, animal, plant and environmental sciences. The Institute aims to integrate these disciplines and to encourage joint research in order to enhance our understanding of interactions between different life forms, their interactions with the environment, and to find solutions to a variety of problems arising from these interactions. The research at the IWWR is carried out by complementary, closely interacting research groups, which study the ways in which cells, organisms and ecosystems are adapted to stress. The research done in most departments is wide-ranging, while clear research goals provide excellent opportunities for interdisciplinary collaboration.



The availability – or excess – of water will be the main global environmental problem in the 21st century. Water shortages are likely to increase in many parts of the world, while many flood-plains will increasingly suffer from flooding in specific seasons. In addition, poor water quality is challenging human populations and natural ecosystems alike. Organisms and ecosystems adapt to specific water regimes, but changes in water quantity and quality result in stress responses. Research at IWWR focuses on water, wetland and associated terrestrial systems in which there is considerable variation in environmental conditions, both in space and time and from the gene to the population level. The specific relationships between the organisms living in these fluctuating environments – as well as the regulatory mechanisms used to maintain homeostasis – are studied under both natural and experimental conditions. The IWWR has two main research programmes.

## *Ecological research*

Traditionally the stress response and adaptation of ecosystems have played a central role in most of the research carried out at the IWWR. There are groups working on plant and animal ecology, aquatic ecology and environmental sciences.

A major scientific innovation has been achieved by linking and extending the ecological research to the genomic level. In this way the fundamental principles of stress and adaptation to changing aquatic environments can be studied at all levels of biological organization. This fundamental knowledge produces predictions about how systems respond to environmental change, forming the basis for novel applications in ecosystem management and water purification.

## *Gene-environment research*

In the research on gene-environment interactions, a link is made between ecosystems and the genomic level, with a focus on individuals, populations and communities. Molecular and genomic tools have revolutionized ecology in the last ten years, providing unprecedented insight into, for example, microbial community composition and functioning and the evolutionary and ecological history of species and populations.

Research groups at the IWWR are at the forefront of developing and applying the latest genomic techniques in order to unravel the inherent genetic constraints and opportunities of ecosystems, in particular in their responses to changes in water quantity and



## Staff

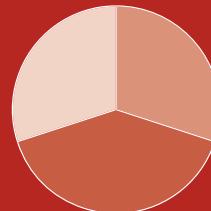
Prof. C.W.P.M. Blom (o)  
Prof. A.M. Breure (e)  
Prof. N.M. van Dam (o)  
Prof. G. Flik (o)  
Prof. A.G.M. Gerats (o)  
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Prof. D. van de Meent (e)  
Prof. J.G.M. Roelofs (o)  
Prof. J.H.J. Schaminée (e)  
Prof. H. Siepel (e)

### Tenured

Full Professors	3.9 FTE
Associate Professors	2.3 FTE
Assistant Professors	4.4 FTE
Researchers	1.2 FTE

### Non-tenured

Researchers	8.4 FTE
Doctoral candidates	40.9 FTE



FTE 1<sup>st</sup>  
FTE 2<sup>nd</sup>  
FTE 3<sup>rd</sup>

quality. This research comprises all major biotic components of ecosystems and micro-organisms as well as those of plants and animals. Adaptations and stress responses of organisms are also studied in the context of molecular and physiological regulatory mechanisms, in both plants and animals. This research provides fundamental knowledge on how and why individuals respond to environmental stressors the way they do and identifies the ecological and evolutionary opportunities for and constraints to adaptation.

### Research facilities

The IWWR has nine departments in the new Huygens Building – all with state-of-the-art modern laboratory facilities – and a central analytical service. The equipment used includes:

- State-of-the-art light microscopy and electron microscopy facilities for detailed analysis of the ultrastructure of micro-organisms, animals and plants
- Extensive molecular biological facilities, such as quantitative RT PCR, RNA interference and *in-situ* hybridisation techniques for analysis of single cells up to complex ecosystems
- Extensive culture facilities for microbes, plants, fish and amphibians

- PHYTOTRON – a unique national research facility for detailed ecological research on sub-surface processes such as root formation under varying oxygen conditions.
- A Solanaceae collection and greenhouses (part of the IWWR's large-scale facilities).

### Collaboration

Research is conducted in close collaboration with over one hundred national and international research groups, research institutes, companies and governmental organizations, including the Institute for Society and Information systems (ISIS), the Center for Wetland Ecology (CWE), the Darwin Center for Biogeology, various environmental biotechnology companies, and water boards.

### Research results

The IWWR microbiologists screened many different peat lands, together with NIOZ and IWWR Aquatic Ecology in a DARWIN-funded project, demonstrating that the symbiosis between methane oxidizing bacteria and *Sphagnum* in peat mosses is ubiquitous. The diversity of the methane oxidizing communities was investigated using DNA micro-arrays. These results were published in *Nature Geoscience*. Furthermore the microbiologists

# Institute for Water and Wetland Research



Prof. Nicole van Dam (Full Professor) is involved in ecogenomics. She studies the responses of plants – in particular those belonging to the *Solanum* and *Brassica* species – to stress factors such as flooding, drought and the impact of herbivores.



elucidated the mechanism of nitrite-dependent methane oxidation by a combination of metagenome sequencing and stable isotope. *Methylomirabilis oxyfera* bacteria were shown to produce their own oxygen from nitrite – an astonishing finding that was published as an article in *Nature*. The application of anammox bacteria was investigated in a joint project with TU Delft, showing that wastewater treatment plants can be turned into energy generating systems, potentially saving millions of euros in operational costs. This work was published in *Science*. The cellular location of ATP synthase and other protein complexes in anammox bacteria was investigated with electron microscopy and mass spectrometry. Four PhD studies were defended in 2010.

A new Department of Ecogenomics was established in 2010. Specific experimental protocols designed to analyze interactions between flooding, drought and herbivore responses in bittersweet (*Solanum dulcamara*) have been developed to be used in the collaborative IWWR effort that has coalesced around this plant species in the B'sweet group. In collaboration with colleagues at the Trace Gas Lab at the IMM, IWWR scientists have designed a PTR-MS based protocol that can be used to detect specific compounds which are markers for cryptic root herbivores in *Brassica nigra* plants.

IWWR Plant Molecular Physiologists are extending collaboration on *S. dulcamara* in order to study the physiological adaptation of this plant to various environmental conditions. To do this, molecular tools and knowledge on the whole transcriptome of this species were developed in 2010 and these will be further expanded in the future.

IWWR Plant Geneticists defined a gene involved in carpel and ovule formation, the first of its kind and thus the defining member of its clade (MADS-box genes). They also contributed substantially to the genetic definition of *S. dulcamara* materials.

In 2010 the Department of Organismal Animal Physiology succeeded in assessing the functional expression of thyroid hormone transporter proteins, a unique result in this field. Studies on the bone-forming cells associated with scales of carp and zebra fish were completed and successfully submitted to the prestigious journal *Bone*.

The Department of Animal Ecology & Ecophysiology found that native fish and molluscs are under greater threat from global warming than the non-indigenous species currently present in the Rhine. Research on predation, mangrove root structure and the utilization of carbon helped explain the use by fish of back reef habitats, while testing acoustic cues for the animals showed that coral larvae react to sounds from the reef in order to orientate.

In 2010, IWWR Environmental Scientists demonstrated that the total energy required by a commodity is a good predictor of its environmental burden, with the exception of agricultural products. These kinds of relationships facilitate impact assessments in environmental management, where there is an immense shortage of data. Species richness in urban waters was found to be remarkably high. In fact, the number of aquatic species in cities exceeded the diversity in rural areas. This investigation not only indicated which physical-chemical factors determine the species composition – it also showed how nature in cities can be preserved and restored.

Ecologists from the Department of Aquatic Ecology and Environmental Biology published an overview of the effects of nitrogen deposition on vegetation in Europe in *Global Change Biology* and this was identified as a scientific highlight by the Editor of *Nature Geosciences*. Five PhD students studying at this department successfully defended their theses in 2010.

In a biodiversity experiment in the Nijmegen Phytotron, the IWWR's Experimental Plant Ecologists studied the rooting patterns of plants, using an innovative molecular method to quantitatively distinguish the roots of different species. Contrary to common belief, the roots of different species did not occupy different layers in the soil but were closely intertwined. These patterns suggest that currently unknown mechanisms of root interactions are at work, with profound consequences for ecosystem processes. Population models were employed by the plant ecologists to test whether plant populations are able to withstand climate fluctuations, with the conclusion that they are not. All of these key results were published in top-ranking ecological and plant physiological journals.

### Societal impact

Most of the research at the IWWR is fundamental, but it also has many strategic and applied aspects. The ecological research closely relates to major environmental problems including climate change, pollution, and eutrophication and their effects on biodiversity, soil quality and water quality. For this reason, much of this research has been commissioned by policy makers, nature managers and water managers.

The discovery and elucidation of the mechanism of *M. oxyfera* bacteria by the microbiologists at the Institute will have great impact on the models for the methane and nitrogen cycle. Furthermore, new waste-water treatment plants based on both *M. oxyfera* and anammox can be designed to remove nitrogen from industrial and municipal waste streams more cost effectively.

The results obtained by research in the Ecogenomics department may be used by breeding companies searching for natural resistance factors in crop plants. The PTR-MS analyses developed with the Trace Gas Lab may be used in quarantine facilities to screen crops and ornamental plants for contamination with root pests. Plant physiologists continue a stable collaboration with Agrico Research on the potato and with Nunhems on the tomato. The latter has led to the filing of two patents applications.

The *Petunia* system – and in particular the transposable element insertion technology devised by IWWR plant geneticists – is used by several companies to identify candidate genes for traits such as drought, cold tolerance or resistance to specific diseases such as *Botrytis*.

In the context of the multidisciplinary programme 'Aggression in Catfish', ethics related to animal welfare received a great deal of attention in a two-day international workshop at Utrecht University. In the spring, the documentary 'Sea the Truth' produced by the 'Nicolaas Pierson Foundation' was released, featuring Prof. Gert Flik as a specialist on stress research in fish.

Studies by IWWR animal ecologists provide tools for use in restoration and nature development projects – in particular for aquatic systems – as well as tools for dealing with biofouling. One of these projects is nature development in the Port of Rotterdam. Other studies on the nursery function of back reef habitats (mangroves and sea grass beds) for coral reef fish were useful for coastal management and conservation as these habitats suffer severe degradation through human impact.

The Department of Aquatic Ecology closely cooperates with its spin-off company B-Ware Research Centre that specializes in valorizing state-of-the-art knowledge related to biogeochemistry and ecology, based on fundamental and applied knowledge generated in the department. Staff members of the department have advisory roles in a variety of committees with considerable societal impact.

The knowledge that scientists at the Department of Experimental Plant Ecology build up is used in a number of applications, such as improving crop yield in water or nutrient-limited agriculture. Work is in progress to use their population model predictions to protect wild plant and bird species, together with partners in Natuurplaza.

### Future research

Microbiologists at the IWWR will continue to investigate the role of anaerobic ammonium and methane oxidation in marine and fresh water ecosystems, both in laboratory bioreactors and natural oxygen-limited ecosystems. Together with researchers at the NIOZ, the role of anaerobic ammonium and methane oxidizing micro-organisms in the estuarine will be studied, using unique ladderane lipids as biomarkers and proxies. Furthermore, the fate of methane in various wetland and volcanic ecosystems will be assessed using stable isotopes as well as molecular and environmental genomic methods. The cellular structure of various bacteria will be investigated with state-of-the-art electron microscopy.

Over the next year ecogenomics researchers at the Institute will develop and use various genomics and metabolomics tools to study the interactions between plants, herbivores and abiotic stresses in more detail. Moreover, the intention is to expand the research infrastructure and intensify collaboration between groups at the IWWR and with the IMM.

The objective of the future research of the plant molecular physiologists at the Institute is to explore biodiversity in order to

# Institute for Water and Wetland Research

## Key publications

Berg, L.J.L. van den, Vergeer, P., Rich, T., C.G., Smart, S.M., Quest, D. & Ashmore, M.R. (2010). Direct and indirect effects of nitrogen deposition on species composition change in calcareous grasslands. *Global Change Biology*, 2 NOV 2010, DOI: 10.1111/j.1365-2486.2010.02345.x.

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Dissertations:	15
Scientific publications:	185
Professional publications:	27
Patents:	2

## Director: Prof. Hans de Kroon

Hans de Kroon has been a Full Professor of Experimental Plant Ecology at Radboud University Nijmegen since 2000. He graduated at Utrecht University, worked in several institutes in the USA and was an Associate Professor at Wageningen University. He specializes in plant traits, especially those below ground, and he was responsible for building the innovative experimental facility, the Nijmegen Phytotron. Another research interest is population modelling, through which the effects of traits are scaled up to responses at the level of natural populations and communities.



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identify new traits that allow plants to adapt to their environment. Plants' responses to a range of environmental cues will be studied in collaboration with colleagues at the IWWR.

Plant geneticists at the Institute contribute to the *Solanum dulcamare* model species by co-developing a whole-transcriptome analysis and a genetic analysis of natural accessions. This group research will involve making insertion libraries containing over 100,000 transposon insertions available to interested parties.

The Department of Organismal Animal Physiology is planning a large-scale study of the effects of transport stress on eels. Early in 2011 a postdoc will start fundamental research on the principle of allostasis in fish, as part of the EU programme COPEWELL.

The animal ecologists at the Institute will intensify cooperation on the study of biological invasions within the IWWR as well as with Natuurplaza. Future research will also include testing critical hypotheses via field observations, mesocosms and experiments in climate rooms in order to predict future developments.

The focus for the Department of Environmental Science will remain on unravelling the relative and combined impact of physical-chemical stressors, because of the complex scientific challenges they present and the rapidly growing interest in society. Five PhD graduations are already scheduled for the first half of 2011.

Future research by the aquatic ecologists at the Institute will focus on biogeochemistry-ecology interactions, mainly in wetlands, related to global changes including climatic change, pollution of air, water and soil, involving intensive collaboration within the IWWR. Investments in new equipment in 2010 will facilitate novel research on ecosystem carbon cycling.

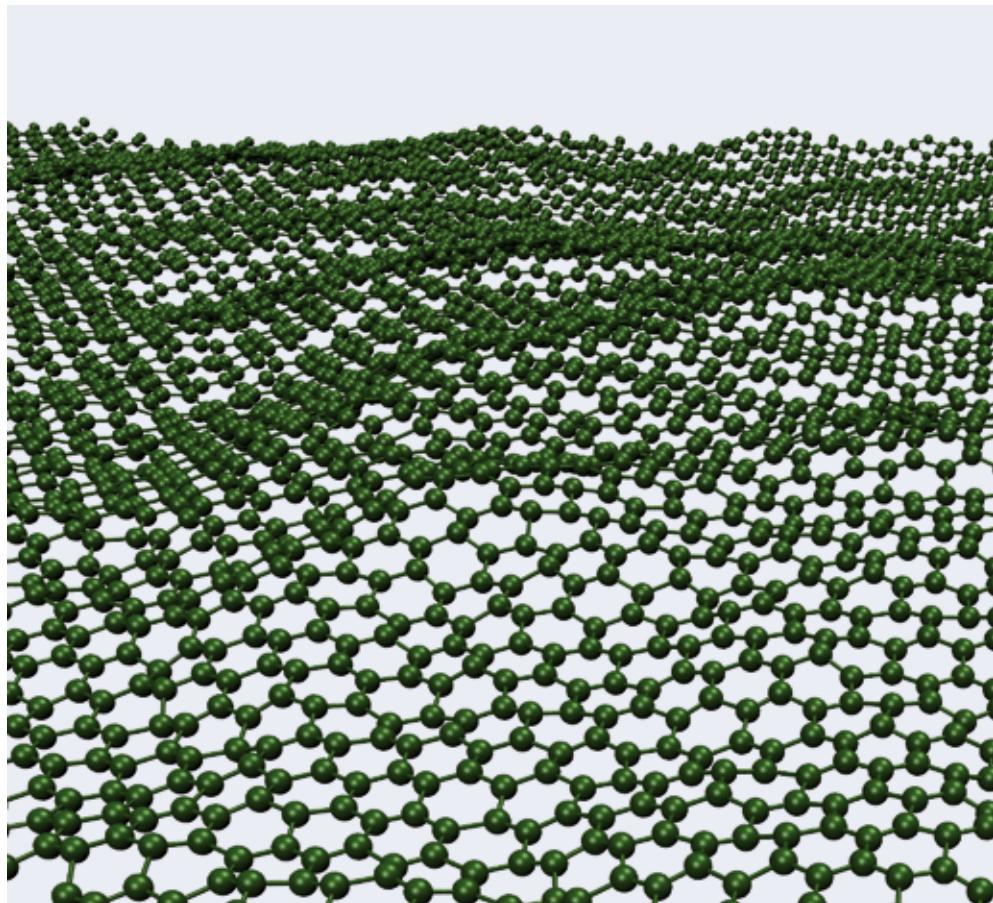
Continuing work by the plant ecologists at the Institute, involving collaboration with soil scientists, plant pathologists, and microbiologists, focuses on understanding the mechanisms of root interactions. In new international collaboration with colleagues in Germany, Panama and the USA experiments and models are being developed that indicate how these interactions and traits influence plant populations, communities and ecosystems.

### Awards

- Prof Mike Jetten was elected as a member of the Royal Netherlands Academy of Arts and Sciences.
- Johan Gielis, PhD won the Social Innovation Award (Tilburg) and shared the Young Antenna Engineer 2010 award of the European Space Agency ESA

# Institute for Molecules and Materials

The aim of the Institute for Molecules and Materials (IMM) is to conduct research and train undergraduate and graduate students in functional molecular structures and materials. There is an emphasis on understanding and controlling complexity in order to design new functionality in these systems.

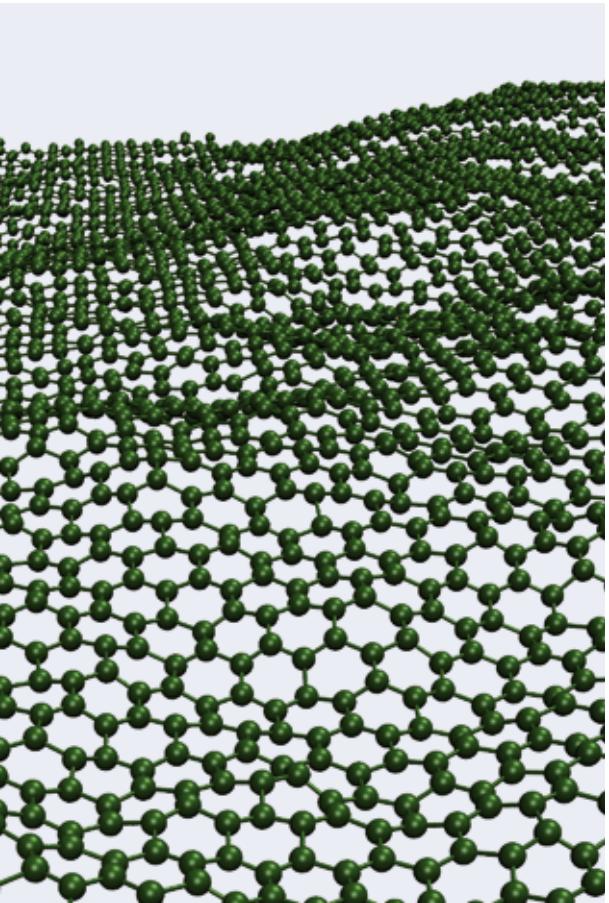


In physics, chemistry and biochemistry the desire to understand complexity in systems is spurred by the wish to manipulate their functionality. In recent decades scientists have approached the problem of complexity from two directions. On the one hand, achieving an advanced understanding of complexity involves the study of the smallest building blocks and using them incrementally to build larger and larger systems. In this way the structure and functionality of atomic nuclei, atoms, and molecules have been investigated and analysed. Combined experimental and theoretical work has extended our knowledge of the behaviour of these systems.

On the other hand, continuous efforts focus on the study of macroscopic systems with well-known properties or to analyse the constituents of large systems that by itself have been investigated extensively. Examples include many-body problems in physics or advances in the life sciences designed to better understand systems on a cellular and subcellular scale.

One of the major challenges ahead is to understand the complexity and functionality in the area where these two directions meet, namely the field of nanoscience. This large interdisciplinary field, at the interface between chemistry and physics, is advanced at the IMM by 20 research groups organized in three main divisions: 1) Design, synthesis and growth, 2) Spectroscopy and characterization, and 3) Theory and simulation. The main objectives are expressed in three fundamental research questions:

- *What are the fundamental properties of electron-correlated systems?*  
To understand intriguing phenomena in electron-correlated materials such as ultrafast magnetization dynamics, work on the electronic properties of oxidic and graphene materials and the fractional quantum Hall effect is currently at the forefront of condensed matter research.
- *How does the process of self-organization of complex systems work?*  
An advanced understanding of self-organization in complex molecules and nano-sized materials is of great significance, since it bridges the domain of relatively well-understood atoms and small molecules and more complex macromolecular and supramolecular structures.



## Staff

Prof. J.G.J. van den Brink (e)  
 Prof. L.M.C. Buydens (o)  
 Prof. A. Fasolino (p)  
 Prof. A.J. van Gool (e)  
 Prof. R.A. de Groot (o)  
 Prof. P.H.H. Hermkens (e)  
 Prof. J.C.M. van Hest (o)  
 Prof. W.T.S. Huck (o)  
 Prof. M.I. Katsnelson (o)  
 Prof. A.P.M. Kentgens (o)  
 Prof. J.C. Maan (o)  
 Prof. W.L. Meerts (e)  
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 Prof. R.J.M. Nolte (o)  
 Prof. D.H. Parker (o)  
 Prof. G.J.M. Pruijn (o)  
 Prof. T.H.M. Rasing (o)  
 Prof. A.E. Rowan (o)  
 Prof. F.G.M. Russel (e)  
 Prof. F.P.J.T. Rutjes (o)  
 Prof. S.E. Speller (o)  
 Prof. E. Vlieg (o)

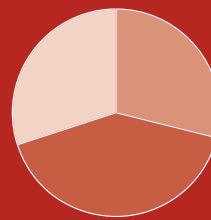
Prof. J. de Vlieg (e)  
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 Prof. G.W. Vuister (p)  
 Prof. W. van de Water (e)  
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 Prof. W.J. van der Zande (o)

### Tenured

Full Professors	9.7 FTE
Associate Professors	3.1 FTE
Assistant Professors	8.9 FTE
Researchers	2.0 FTE

### Non-tenured

Researchers	46.5 FTE
Doctoral candidates	80.0 FTE



FTE 1<sup>st</sup>  
 FTE 2<sup>nd</sup>  
 FTE 3<sup>rd</sup>

- *What are the fundamental properties of biomolecular systems, especially those that play an important role in biology-driven problems?* The answer to many unsolved problems in cellular and sub-cellular systems lies in the behaviour and interplay of individual biomolecules and biomacromolecules. Within the IMM the research focus is to unravel the fundamental properties of biomolecules in complex environments.

### Research facilities

The national and international position of the IMM is strengthened by the availability of a number of large-scale experimental research facilities, including:

- A High Field Magnet Laboratory (HFML) for continuous fields up to 33 Tesla (with the ambition and funding to achieve 38 Tesla in 2012 and 45 Tesla in 2014)
- A Large-Scale Facility for high resolution liquid NMR and a Solid-State NMR Facility for advanced material science including an 850 MHz proton NMR instrument
- A Scanning Probe laboratory with a broad range of STM and AFM techniques (NanoLab)

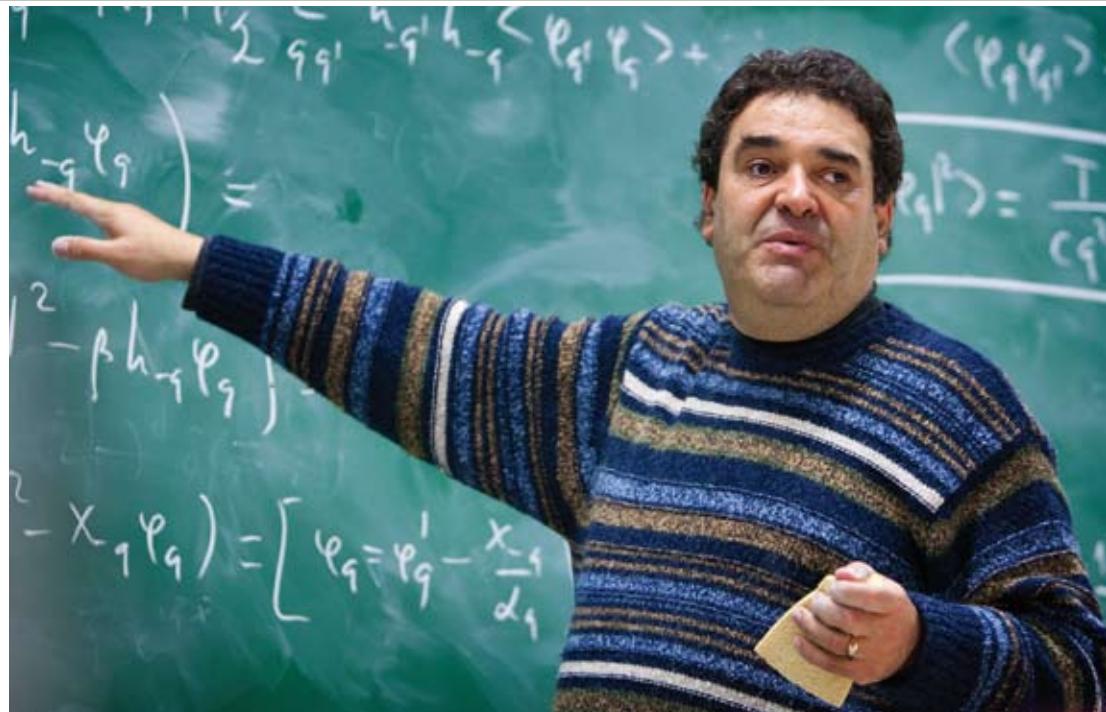
- A Trace Gas Facility (TGF) for the application of laser diagnostics in biology and medicine
- A Free Electron Laser for Terahertz Experiments (FLARE; due to be operational in 2011), and Free Electron Lasers for Infrared and Intracavity Experiments (FELIX/FELICE from the FOM Institute Rijnhuizen; to be relocated in 2013).

Other special facilities include:

- A Solar Cell Research Facility (SCRF) for the application of dedicated processing and analysis equipment in solar cell research, including a clean room. In 2011 an outdoor calibration facility (OCF) will be established.
- Electron structure calculations of materials (computational facility at FOM) for designing new materials and structures based on first principle quantum mechanical calculations
- A Thin Film Growth Laboratory, in which materials and thin films can be grown with atomic precision.

# Institute for Molecules and Materials

Prof. Mikhail Katsnelson (Full Professor) is a theoretical physicist whose research contributes to scientific insight into interactions within crystalline structures and molecules. He was one of the pioneering researchers who worked on graphene. See picture p. 120-121.



There are a large number of collaborative initiatives between IMM research groups and research groups at universities and research institutions worldwide. At the university level, external collaboration takes place in the International Research Universities Network (IRUN). The aim of IRUN is to further improve the quality of research and teaching at the universities involved. Within the network, the exchange of researchers, lectures, and students is encouraged and facilitated. This can lead to joint curriculum development and joint degree programmes both for Masters students and for PhD candidates. The IMM currently collaborates with groups from Münster, Duisburg/Essen, and Barcelona.

On 31 May 2010 Radboud University Nijmegen and the Forschungszentrum Dresden-Rossendorf (FZD) signed a Memorandum of Understanding to intensify their collaboration on High Field Magnet Labs. As Nijmegen specialises in continuous fields and Dresden in pulsed fields, this collaboration will strengthen the international position of both labs and encourage joint research. Also in 2010 the FP7 project for work on the European Magnet Field Laboratory (EMFL) was approved by the EU. This project will involve investigating all legal, financial, organisational, and employment related issues, culminating in a Founding Agreement for the EMFL signed by the three partners (Radboud University Nijmegen, FZD, and CNRS: Grenoble/Toulouse), plus any other stakeholders that may be identified.

In 2010 a Memorandum of Understanding for Collaboration on Graduate Studies and Research & Development was signed by Radboud University Nijmegen and the Ruhr University Bochum (RUB), who aim to cooperate in fields of common interest for scientific research and technology development in Terahertz Science and Life Sciences. Collaboration with other universities includes the Katholieke Universiteit Leuven in Belgium on single molecule spectroscopy (the group led by Profs. J. Hofkens and F.C. de Schryver). This collaboration involves the exchange of PhD students and postdocs as well as the use of the special laser equipment at the two locations. Several of the organic chemistry groups at IMM collaborate with the University of Barcelona. Within the field of graphene research, the groups at the IMM led by Profs. Katsnelson and Maan collaborate intensively with Profs. Geim and Novoselov of the University of Manchester. This involves several joint postdocs and graduate students working on both theory and measurements in the HFML. There are also strong links between the IMM and the Fritz Haber Institute of the Max Planck Society in Berlin (Director Prof. G.J.M. Meijer) and the Fraunhofer Institut für Mikroelektronische Schaltungen in Duisburg.

Many of the groups in the IMM participate in EU projects with other European partners, which is very rewarding both with respect to strengthening research contacts and training PhD students and postdocs.

## Research results

A summary of the research results in 2010 is presented below under the three main themes of the institute.

### Electron-correlated systems

Prof. de Groot and colleagues have built first-principles models of multi-layer structures of alternating hydrogenated amorphous silicon and silicon nitride. These materials are relevant for the production of large-scale photo voltaic cells at lower energy costs than those based on crystalline silicon wafers.

The high electron mobility in graphene is one of the main reasons why this new material is so promising for electronics applications. Using a combination of first principles structure calculations and quantum theory of electron transport, Prof. Katsnelson and colleagues have demonstrated that carbon-carbon chemical bonds between graphene and organic pollutions explain the experimental data for exfoliated graphene. (*Phys. Rev. Lett.*).

At the High Field Magnet Laboratory headed by Prof. Maan a new type of B-periodic oscillations was discovered which solely depends on quantization without involving a secondary effect of interference of electron waves and these oscillations are therefore only governed by the magnetic field itself and known natural constants. (*Nature Physics*).

Profs. Rasing and Van der Zande and colleagues have addressed the role of the coherence of a quantum-mechanical system and that of an electromagnetic field in the transfer of angular momentum. While exciting rubidium vapor with shaped laser pulses, the polarization of the fluorescence was measured to ascertain the amount of angular momentum transferred to rubidium. In this way a complex and non-intuitive response of a well-defined quantum-mechanical system to a coherent excitation could be demonstrated (*Phys. Rev. Lett.*).

In the NanoLab headed by Prof. Speller well-defined nano-scale patches of alkanethiols were constructed in a matrix of self-assembled monolayers on an atomically flat gold surface by so-called 'nanografting'. The results demonstrate that nanografting is a powerful method for studying self-assembly at the nano or even the molecular scale under liquid.

Prof. Kentgens and his group obtained an unprecedented NMR resolution for aluminium in nano-porous zeolite single crystals. Zeolites are aluminosilicate materials that have a major impact on catalysis, ion exchange, and as molecular sieves. The microcoil probe heads developed by this group alleviate existing sensitivity and resolution problems.

### Self-organizing systems

Prof. Hageman and colleagues have prepared scandium-nitrate (ScN) layers using the Hydride Vapour Phase Epitaxy (HVPE) growth technique. This method uses ammonia and scandium-chloride, made in-situ through the reaction of scandium and gaseous HCl. It has been shown that the chlorine impurity concentration in the ScN increases with decreasing substrate temperature.

Prof. Vlieg and colleagues investigated the formation of Wurtzite Indium-Phosphor nano-wires, using surface X-ray diffraction at the European Synchrotron Radiation Facility in Grenoble, showing that the formation of the zinc-blende crystal structure is sterically hindered by the presence of the metal atoms at so-called hollow site positions. The binding of Indium and Phosphor to the remaining two atomic sites around the hollow site results in the Wurtzite crystal structure. (*Nanoletters*).

Prof. Nolte and colleagues have shown that Cowpea Chlorotic Mottle Virus particles can be assembled into well-defined micron-sized objects and be reversed back into individual viruses by applying a short optical stimulus. The photo-sensitive dendrons, which achieve spatial and temporal control over the binding targets that are used for this, are ultimately useful for the controlled assembly of functional protein cage arrays. (*Nature Chemistry*).

Prof. Huck and his group intend to use micro-droplets as artificial cells of which important parameters, such as volume, concentration, and internal membrane area can be varied. (*Angewandte Chemie*).

Prof. Parker, Prof. Van der Zande, Dr Groenenboom, and colleagues have used the velocity map imaging technique to visualize, for the first time, the precession of a quantum mechanical angular momentum vector. The spinning atoms are produced by photodissociation of molecular oxygen at 157 nm. (*Front cover, Nature Chemistry*).

Because the previous version of the catalyst had some drawbacks, which hampered its practical use as a processive catalyst, Prof. Rowan and his group have constructed a new analogue of the so-called 'Mn2' enzyme catalyst, with tails covalently attached to the outer surface shielding the outer face of the catalyst. This new catalyst, which is exceptionally stable, can thread onto the end of micrometer long polymeric substrate and move along converting every double bond by insertion of oxygen atoms to provide the polyepoxide. (*J. Am. Chem. Soc.*).

### Biomolecular systems

Prof. van Hest and colleagues have designed a polymersome nano-reactor that is capable of entering cells, where it can induce intracellular catalysis. The catalytic activity conferred to the cells was maintained at levels that were significantly higher than those

# Institute for Molecules and Materials

## Key publications

Carbone, C., Veronese, M., Moras, P., Gardonio, S., Grazioli, C., Zhou, P.H., Rader, O., Varykhalov, A., Krull, C., Balashov, T., Mugarza, A., Gambardella, P., Lebegue, S., Eriksson, O., Katsnelson, M.I. & Lichtenstein, A.I. (2010). Correlated Electrons Step by Step: Itinerant-to-Localized Transition of Fe Impurities in Free-Electron Metal Hosts. *Physical Review Letters*, 104(11), 117601.

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Dissertations:	23
Scientific publications:	299
Patents:	4

reported for soluble enzymes. The results therefore represent a significant step towards a functional artificial organelle. (*Angewandte Chemie*).

In the group led by Prof. Pruijn exosomes were isolated from human cells by immunoaffinity purification and size-separation. In addition, a protein homologous to previously identified yeast and human 'Dis3' proteins – designated human Dis3-such as exoribonuclease 1 (hDis3L1) – was identified and a procedure for detecting cytoplasmic rRNA degradation intermediates with adenosine-rich tails was developed. The results showed that a reduction of hDis3L1 led to strongly elevated levels of these degraded RNA molecules. (PNAS).

Prof. Rutjes and colleagues have devised a chemical synthesis that can be executed in a matter of days to obtain a novel reagent (BCN) which combines high reactivity with good stability. The straightforward synthesis of BCN is opening up unique opportunities for reagent-free, yet highly efficient, covalent connection of molecular structures, with many potential applications. (*Angewandte Chemie*).

Profs. Buydens, Wijmenga, and colleagues are developing metabolomics methodologies, involving NMR spectroscopy and data analysis for the fingerprinting of Multiple Sclerosis. The results show that the model they have developed and the disease markers, which are found in the first animal model, can predict neuroinflammation with a high degree of accuracy.

Prof. Vuister and his group investigated the regulation of the Sodium-Calcium exchanger, a membrane protein involved in calcium homeostasis. How the binding of magnesium-ions alters activity of the exchanger remains to be established and, for this purpose, physiological experiments need to be performed.

## Awards and grants

In December 2010, the Nobel Prize for Physics was awarded to Profs. Geim and Novoselov of the University of Manchester. Prof. Geim is also an extraordinary professor at Radboud University Nijmegen and has been an associate professor at the HFML. Prof. Novoselov obtained his PhD at Radboud University Nijmegen in 2004. Subsequently, Prof. Katsnelson and the researchers at the HFML made important theoretical and experimental contributions to work on graphene.

Prestigious ERC Starting grants were awarded in 2010 to Profs. Cuppen, Elemans, and Kimel. Prof. Rasing became an elected member of the Royal Netherlands Academy of Arts and Sciences (KNAW) and he received a knighthood in April 2010. A Netherlands Organisation for Scientific Research (NWO) Vici was awarded to Prof. Van Hest and Vidis went to Profs. Van de Meerakker and Cuppen. Prof. Vlieg received an ECHO grant from NWO. Profs.

# Institute for Molecules and Materials

Kimel and Blank both obtained a FOM Grant in 2010. Finally, Prof. Katsnelson received the University's 2010 Science Award.

## Societal impact

The valorisation of knowledge through university research and the societal impact of science are becoming increasingly important as indicators of scientific success. The IMM therefore encourages the initiation of spin-off companies and the filing of patents. There are formal cooperative arrangements with all of the major companies in the Netherlands, including DSM, Philips, MSD, Solvay, Unilever and AkzoNobel. The large infrastructure of the IMM has resulted in long-standing business relations with medium-sized technology-oriented enterprises near Nijmegen.

The IMM has been actively involved in bridging the innovation gap, as is demonstrated by the many mostly chemical spin-off companies, such as Chiralix, Encapson, FutureChemistry, Mercachem, ModiQuest, ReRa Systems, SensorSense (physics), Spinnovation, Syntarga, Synthon, and tf2 devices that have been successfully established in the past decade. Together they have generated some 1.000 jobs in the region and many IMM graduates now find their first job there. Moreover, graduates from IMM are employed at R&D departments of companies and thus take the latest scientific insights into industry.

Technology Corporation STW awarded Synaffix a Valorisation Grant worth 25,000. The aim of this grant is to translate scientific knowledge into new high-tech business. TeraOptronics received first prize for the best proposition presented at the 2010VNO-NCW Business Challenge. TeraOptronics is a technological spin-off that intends to develop a new type of terahertz camera, the TeraCam, from initial scientific idea right through to industrial application.

IMM's outreach to small and medium-sized enterprises is further embodied in the NanoLab, whose primary goal is to facilitate knowledge transfer between the university and industry. Companies can make use of a training unit as well as five research units that focus on biomedicine, nano-electronics, nano-chemistry, nano-optics and nano-materials.

Finally, active close collaboration with NCMLS includes developing novel tailor-made molecular, macromolecular and biomacromolecular systems for monitoring and addressing personal health issues. This work involves real-time NMR and scanning-probe imaging of identified species, targeted drug-delivery systems and diagnostics on a nanometre scale with the development of molecular sensors and markers. Also, non-invasive diagnostic tools are being developed such as 'the breath test', which allows researchers to analyse the trace gas constituents of human breath for diagnostic purposes.

Individual researchers maintain both scientific and societal contacts and they undertake outreach and press activities to promote either their own research or science in general. On occasion, many researchers also contribute to magazines of general scientific interest, public discussions in 'Science Cafes' and outreach to primary schools. Sometimes there are also interviews for radio or newspapers. The IMM encourages these initiatives and coordinates press releases, scientific and non-scientific reports as well as larger news events.

## Future research

Future research within the Institute will take place within three broad research themes that merge physics and chemistry based on seeking answers to the following questions: 1) How can we understand the exciting, yet unresolved, issues related to correlated-electron systems and nano-sized materials? 2) What is the science behind self-assembly of complex molecules? And 3) What are the unique properties of biomolecules which explain their function in cellular systems?

A major continuing challenge is provided by a large grant from the national investment in large infrastructures (NWO-BIG) in 2006. This grant enables the IMM to construct a new 45 Tesla hybrid magnet for the HFML and a Free Electron Laser for research using Terahertz radiation (FLARE). FLARE will create unique opportunities for studying magnetic excitations in inorganic and organic molecules as well as low energy spectroscopy (far-infrared) on molecular clusters and large molecules and biomolecules. The new hybrid 45 Tesla magnet will provide new research opportunities based on cutting-edge technology. FLARE will also be used for experiments in the high magnetic fields and thus create experimental conditions that are unique worldwide.

On 5 October 2010 the Foundation for Fundamental Research on Matter (FOM) and Radboud University Nijmegen agreed to relocate the free electron laser facilities (FELIX/FELICE) and associated staff from the FOM Institute Rijnhuizen to IMM in 2012. Combining FELIX, FELICE and FLARE in one free electron laser facility, together with the HFML will provide open-access user facilities and create great opportunities for physics, chemistry and the life sciences.

The HFML is included in the ESFRI Roadmap for European Research Infrastructures and its national equivalent (the 'Lijst Van Velzen'). The HFML is recognized as a national research facility by the Dutch Science Foundations FOM and NWO and discussions about increased funding and tripling the number of operational hours are ongoing.

In June 2010 the national Sector Plan for Physics and Chemistry (SNS) was approved, with a very positive outcome for Radboud University Nijmegen. New initiatives can now start in chemical biology and the advanced spectroscopy of functional molecules and materials. The focus on chemical biology puts chemistry back

## Director: Prof. Elias Vlieg

Elias Vlieg has been Professor of Solid State Chemistry at Radboud University Nijmegen since 1998. With a background in physics, his profile illustrates the combined chemistry and physics approach at the IMM. His research focuses on understanding crystal growth and, as head of the Applied Materials Science group, on the use of thin film deposition for solar cells and electronic devices.



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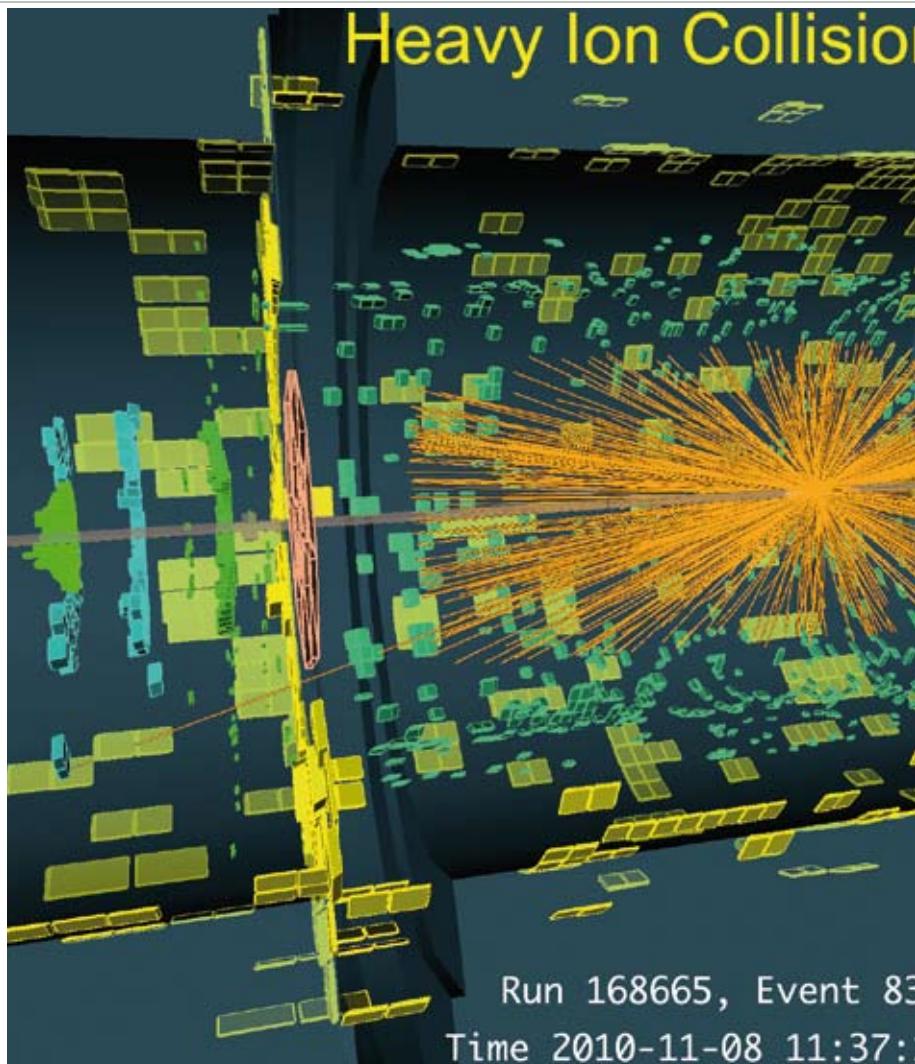
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in a leading position in ground-breaking research at the interface between chemistry and biology. To achieve this goal, interactions among the participating groups will be strengthened and a new complementary research line, linking the organic chemistry and biochemistry groups has already started. The focus in physics is to strengthen research capacities by using the High Field Magnet Laboratory (HFML) and the free electron laser (FLARE) for the study of low dimensional systems and terahertz spectroscopy on strongly correlated systems.

In close collaboration with the Nijmegen Centre for Molecular Life Sciences (NCMLS/UMC) researchers at IMM have formed a Chemical Biology cluster, in order to further exploit knowledge of organic chemistry at the University and apply it to biochemical, biological, and medical problems. Together with NCMLS research groups and industrial pharmaceutical partners this promising research line will enhance current understanding of complex molecules and make it possible to synthesize molecules with the desired physical, chemical and pharmaceutical properties.

# Institute for Mathematics, Astrophysics and Particle Physics

The Institute for Mathematics, Astrophysics and Particle Physics (IMAPP) carries out fundamental research in mathematics, high-energy physics and high-energy astrophysics, with a special focus on interdisciplinary topics. The overarching research theme is the origin and evolution of the universe and its underlying mathematical structures. The Institute is also actively engaged in outreach.



## Mathematics

This subject centres on three interdisciplinary themes, which have well-established links with computer science and physics: mathematical physics, algebra and logic, and applied stochastics. The traditional areas – algebra, logic, analysis, geometry and stochastics – are studied in the context of these themes.

## Astrophysics

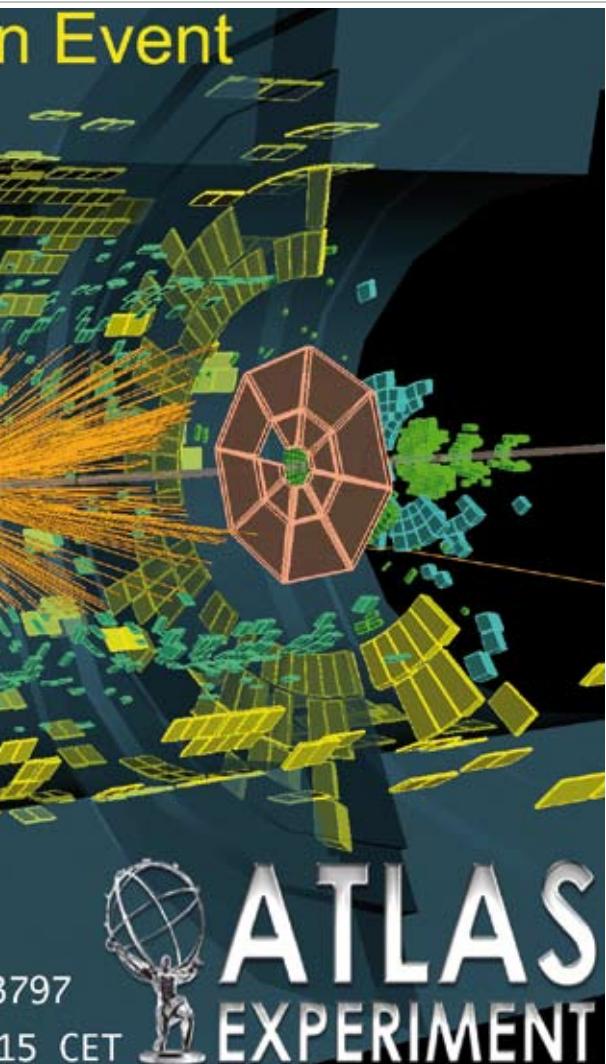
Researchers in this department focus on observational and theoretical research in two areas of high-energy astrophysics: astroparticle physics and compact objects. The main goals are to unravel the sources of the highest-energy particles in the universe and to understand the physics of the surroundings of black holes, neutron stars and white dwarfs and the evolution of white dwarf binaries as important sources of gravitational waves.

## High-energy physics

This group carries out and analyzes experiments in the field of elementary particle physics at the smallest distance and highest mass scales that are attainable. This includes both accelerator-based and cosmic ray experiments and the theoretical foundations of elementary particle interactions. There is a particular focus on electro-weak symmetry breaking and the Higgs boson as an attempt to gain more insight into the structure of vacuum.

## Awards

- Prof. Sijbrand de Jong was chosen as 'Nijmegen citizen of the year 2009'
- Dr Wim Beenakker was awarded the Science Education Award of the Faculty of Science
- Melvin Meijer MSc won the First Poster Prize at Physics@FOM
- José Coppens MSc won the Mirror Image Award for best new role model



## Staff

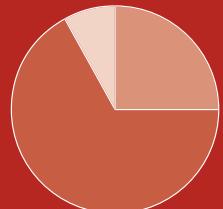
Prof. C.C. Aerts (e)  
 Prof. C. Dominik (e)  
 Prof. H.D.E. Falcke (p)  
 Prof. D. Froidevaux (e)  
 Prof. M. Gehrke (o)  
 Prof. N. de Groot (o)  
 Prof. P.J. Groot (o)  
 Prof. G.J. Heckman (o)  
 Prof. W.H. Hundsdoerfer (e)  
 Prof. S.J. de Jong (o)  
 Prof. R.H.P. Kleiss (o)  
 Prof. H.T. Koelink (o)  
 Prof. J.M.E. Kuijpers (o)  
 Prof. N.P. Landsman (o)  
 Prof. F.H.J. Redig (o)  
 Prof. A.N.J.J. Schellekens (e)

### Tenured

Full Professors	4.4 FTE
Associate Professors	2.0 FTE
Assistant Professors	3.4 FTE

### Non-tenured

Researchers	11.9 FTE
Doctoral candidates	24.6 FTE



■ FTE 1<sup>st</sup>  
 ■ FTE 2<sup>nd</sup>  
 ■ FTE 3<sup>rd</sup>

< "ATLAS Experiment © 2011 CERN"

- Prof. Klaas Landsman was awarded an NWO TOP-GO grant
- Dr Bas Terwijn won the 2010 Shoenfield Prize of the Association of Symbolic Logic
- Dion Coumans MSc won the Radboud University Nijmegen Frye stipend.

## Research facilities

Experimental groups make use of leading national and international astronomical and astroparticle observatories (ESO, La Palma, LOFAR, LOPES, HST, Kascade-Grande and Pierre Auger) and high-energy particle accelerators (Large Hadron Collider [LHC] and Tevatron). The LHC had its first full year of operation, producing exciting new results. The Institute itself houses two optical telescopes and a radio interferometer, which are used for educational activities – and to encourage public participation. The Institute has ‘computing farms’ for both astrophysics and particle physics. It also makes use of the faculty’s mechanical and electronics’

workshops and the facilities of the Amsterdam-based National Institute for Nuclear and High-Energy Physics (Nikhef).

## Collaboration

Mathematicians based in Nijmegen are involved in the NWO mathematics clusters DIAMANT (Discrete, Interactive & Algorithmic Mathematics, and Algebra & Number Theory), GQT (Geometry and Quantum Theory) and STAR (Stochastics-Theoretical and Applied Research). Mathematical physicists at the IMAPP make a major contribution to GQT.

The elementary particle physics group – a partner in the Nikhef – is associated with the European Laboratory for Particle Physics (CERN in Switzerland) and the Fermi National Accelerator Laboratory (FNAL in the USA). There is intensive collaboration between the particle physics theory group and KEK, RIKEN, Tokyo Hosei and Osaka EC University in Japan, Demokritos in Greece and the

# Institute for Mathematics, Astrophysics and Particle Physics



José Coppens MSc (Doctoral candidate) studies subatomic physics. Thanks to her activities, which are designed to encourage school girls to study science or technology, she won the Mirror Image Award for best new role model.



University of Granada in Spain. Astronomical research is carried out within the framework of the top research school NOVA and in association with ASTRON, SRON and ESA. The Nijmegen group co-leads the EGAPS survey, is the expertise centre for cosmic ray detection with LOFAR, and is a member of the LOPES consortium. IMAPP particle physicists and astronomers are joint members of the Pierre Auger Observatory Collaboration in Argentina.

All researchers at the Institute are a member of one of the following Dutch national research schools: MRI (mathematics), OSAP (elementary particles), LOTN (theoretical physics) and NOVA (astronomy) – all accredited by the Royal Netherlands Academy of Arts and Sciences. OSAP was given the status of NWO Graduate Programme, providing extra funding for four PhD students.

## Research results

In 2010, the mathematical physics group celebrated the final year of GQT cluster funding by NWO with an exciting conference, which was held in Nijmegen. There was an outstanding list of speakers, including three former Fields medallists: Michael Atiyah, Alain Connes and Andrei Okounkov. In 2006 the GQT cluster Geometry and Quantum Theory was established as a collaborative venture for mathematicians from Amsterdam, Utrecht and Nijmegen, with a leading role for the latter. In 2010 three new PhD positions for Mathematical Physics in Nijmegen were funded by NWO. Two of these were obtained via the Open Competition and the third was a TOP-GO grant for Prof. Klaas Landsman, in collaboration with Prof. Bart Jacobs (iCIS) and Prof. Ieke Moerdijk (Utrecht University)

on topos theory and quantum computing. An overview article (over 100 pages) on non-compact quantum groups was published. The research of the Mathematical Physics group focuses on Non-commutative Geometry, with two main branches: applications related to the Standard Model of particle physics and the Higgs mechanism on the one hand, and quantum groups and related special functions on the other. Further topics are topos and category theory – in relation to quantum theory – and integrable systems, both at the classical and the quantum level. The research done by the Mathematical Physics group was evaluated last year as very good to excellent. In this research evaluation the Nijmegen Mathematics groups received a special compliment from the Committee for their performance in outreach activities.

In logic, an open problem in algorithmic information theory was resolved by showing that the so-called normalized information distance is neither effectively approximable from below nor from above and new results on open induction in intuitionistic mathematics were obtained. In work connecting computability theory with lattice theory, an analogue of a famous theorem of Skvortsova was proved, namely that there is a factor of the Muchnik lattice that captures intuitionistic logic. New foundations were provided for the theory of recognisability (based on uniform spaces), leading to a proof of the converse of a famous result of Reiterman from 1982 that if a class of languages consists entirely of regular languages then it is given by a topological quotient algebra of the free profinite monoid. In work related to the Jacobian conjecture in algebraic geometry, several cases of Zhao's Image conjecture were established,

while new number theoretic results can be seen as probabilistic evidence that aliquot sequences tend to remain bounded. Finally, in applications related to crystallography, an extensive analysis of the effect of merohedric twinning on reflection conditions was carried out, leading to criteria for confirming or excluding the presence of twinning.

In the Applied Stochastics group a large deviation formalism was developed for the trajectory of the empirical measure. This led to a new insight into Gibb-non-Gibbs transitions in dynamics, which will provide more general and robust results in that area. Correlation inequalities for a large class of bosonic particle systems were also proven. These are the counterparts of earlier negative correlation inequalities for the fermionic particle systems discovered by Liggett *et al.* A maximum likelihood approach to the estimation of parameters in a hierarchical statistical model was developed and applied to an environmental science research project. Limit theorems and large deviation results were proved for the position of a random walk in a large class of dynamic random environments. A new approach to population dynamics models with selection was developed and the Wright-Fisher diffusion with selective drift was derived for a class of individual-based models. A report was produced on increased market stability as a result of consensus and transparency with respect to price ranges for illiquid derivatives.

The Department of Astrophysics was reviewed by the NOVA/Astronomy International Review Board (chaired by Prof. F. Shu) and found to be already among the top 10% of astronomy institutes in the world. It was praised for having the 'most positive gradient' and for being the 'most forward looking' of the Dutch university astronomy departments. NOVA itself was reviewed as 'exemplary' among the six top research schools. Three papers were published in *Nature* or *Science* (on the gamma-ray emission of the nova in V407 Cygni; on the possible supernova Type Ia SN2005E; and on the deviations of uniform spacing in gravity asteroseismological modes in massive stars). Other scientific highlights include the detection of a record short 5.4-minute orbital period in the ultra-compact binary HM Cnc, a strong limit on the flux of the ultra-highest energy cosmic rays and neutrinos from the Westerbork NewMoon project, a study of the shortest period eclipsing binary SDSSJ0926+38, the discovery in an external galaxy of a bright, off-nucleus X-ray source that is possibly a run-away super-massive black hole, many new results from the new satellite missions CoRoT and Kepler (both on asteroseismology and exoplanets) and Hershel (the ESA mission for far-infrared astronomy). In June 2010 the LOFAR radio array was officially opened by Her Majesty Queen Beatrix, and regular observations with LOFAR are now being made. The first self-triggered observations with the Transient Buffer Boards on giant pulses from the Crab pulsar were obtained. Prof. Heino Falcke was appointed as the first chairman of the Board of the International LOFAR Telescope (ILT), which has transformed the purely Dutch LOFAR array into an international facility.

A first part of the AERA radio array (spread over an area of 20 km<sup>2</sup>) was installed at the Pierre Auger Observatory (PAO), making the PAO the first ever triple hybrid detector (ground-level Cherenkov detector stations, air fluorescence stations and now also radio antennae). Using an earlier test setup for radio detection of cosmic rays at the PAO, it was discovered that, in addition to geosynchrotron radiation, the Askaryan effect allows the representation of a significant amount of radio signal from cosmic ray air showers. Using the water Cherenkov and fluorescence detection techniques, it was shown that, although the correlation of the origin of ultra-high energy cosmic rays and known active galactic nuclei has become weaker, they are certainly not coming from isotropically distributed sources. Surprisingly, it was also found that ultra-high energy cosmic rays tend to be heavier nuclei with increasing energy.

The operation of the DØ experiment at the Tevatron collider at Fermilab continued as expected, leading to the collection of a total Run II integrated luminosity of 9 fb<sup>-1</sup> (compared to 7 fb<sup>-1</sup> at the end of 2009). The accelerator and experiment were maintained during an extended shutdown. A surprisingly large violation of particle-anti-particle symmetry was observed in b-quark to muon decays. Direct searches for the Higgs boson have revealed that its mass is unlikely to be between 158 and 175 GeV, while a, yet insignificant, signal is observed in the 120 to 140 GeV region, which is also indicated by precision electroweak measurements, such as the W and top quark mass. The LHC at CERN was routinely operated at a centre of mass energy of 7 TeV, the highest humanly made collision energy ever, collecting a total of 0.1 fb<sup>-1</sup>. The Atlas experiment has shown remarkable data-taking efficiency and data quality. The electronics of the Atlas muon detection system that was designed, produced and commissioned by IMAPP and Nikhef performs exactly as expected. At the end of 2010, lead-on-lead collisions were also achieved at record energy. Apart from reproducing much of the Standard Model physics that was discovered over the last century within a year, several new results were also produced, such as the extension of limits on supersymmetric particles and interesting effects on jet quenching in heavy ion collisions.

On the theoretical side a systematic study of the dominant effects that originate from soft-gluon radiation and the corresponding impact on hadron-collider experiments such as the Tevatron and LHC was conducted. The computer program CAMORRA was completed. This C++ code allows for tree-level amplitude computation for multi-particle processes, both in the SM and SUSY extensions, including its treatment of Majorana fermions. Lattice calculation results for the N=2 linear sigma model were obtained, verifying earlier analytic work on the Higgs effective potential. The effective potential is convex and flat. The so-called R2 rational terms for general one-loop amplitudes were completely calculated. These are necessary ingredients in the OPP approach to automated one-loop calculations.

# Institute for Mathematics, Astrophysics and Particle Physics

## Key publications

Altonen, T., Ancu, L.S., Jong, S.J. de, Filthaut, F., Galea, C.F., Meijer, M.M. & Svoisky, P. (2010). Combination of Tevatron Searches for the Standard Model Higgs Boson in the W+W-Decay Mode. *Physical Review Letters*, 104(6), 061802.

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Dissertations:	2
Scientific publications:	256
Professional publications:	7

## Societal impact

The Institute's fundamental research is designed with long-term objectives in mind. Many results will only produce an impact in future decades, but may then have far-reaching consequences, even changing the way we view the world. The Institute plays an important role in national discussions on science and mathematics in secondary education, *e.g.* supporting the development of the new subjects Advanced Mathematics and Nature, Life and Technology, as well as influencing the mathematics and physics syllabi in secondary education at the highest political level. Four members of staff teach in the prestigious honours programme at the University. The Nijmegen Annual Mathematics Tournament and the national Kangeroe mathematics competition, both organized by IMAPP,

have significantly improved the popularity and visibility of mathematics among school children. The Institute initiated the HiSPARC project, which involves placing air-shower array telescopes on high-school roofs (<http://www.hef.kun.nl/nahsa>). The Astronomy department organizes monthly observation nights. A number of secondary school projects (part of the Dutch university entrance examination) have been produced within the context of initiatives in which the Institute is involved. An entirely new branch of integrating science into society was introduced with Cosmic Sensation (<http://experiencetheuniverse.nl>), translating information about cosmic rays into music and visuals in a huge dome. This unique event was held three times from 30 September 30 to 2 October 2010. Van den Essen's popularisation of mathematics book 'Nieuwe

## Director: Prof. Sijbrand de Jong

Sijbrand de Jong has been a Full Professor of Experimental Physics at Radboud University Nijmegen since 1998. From 1990 to 1998 he served in several functions at CERN in Geneva, Switzerland. He is an expert in the physics of elementary particles. His research focuses on the Higgs mechanism, which he studies at the large accelerators in CERN (Geneva) and Fermilab (Chicago), and on the origin of ultra-high energy cosmic rays, which he studies at the Pierre Auger Observatory (Malargüe, Argentina).



## Institute for Mathematics, Astrophysics and Particle Physics

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*Getallenstelsels*' was published this year and, in this connection, he was a guest on the scientific radio programme, *Labyrinth*.

### Future research

A central topic of research at IMAPP is the origin and evolution of the universe. In astronomy this translates into the study of compact objects, which test the limits of known physics and the study of cosmic rays and gravitational waves, using a multi-messenger approach to create new windows on the universe. The Astronomy department will concentrate on short time-scale variability to explore unknown parts of the universe. For the study of cosmic rays, techniques from radio astronomy and elementary particle physics are used and there is full cooperation between the astrophysicists and particle physicists in IMAPP. The gravitational waves research will concentrate first on the Earth-based interferometer Virgo, with the long-term aim of doing research with the space-based LISA interferometer. In elementary particle physics, an important topic is the structure of the vacuum and the associated Higgs mechanism. The Tevatron collider provides a unique opportunity to get some first hints of the Higgs boson, while in the long run the LHC will definitely make the discovery and measurement of important properties of the Higgs boson possible. Knowledge of the vacuum has significant implications for our understanding of cosmology. Existing theories are used to develop and implement methods for theoretically calculating measurable observables. The possibility that the Higgs mechanism in the Standard Model

has been wrongly interpreted – with far-reaching consequences for cosmology – is being investigated. The mathematical physics department concentrates on methods originating in the mathematical foundations and analysis of quantum theory, applying these in quantum information theory, non-commutative geometry and in pure mathematics. These methods have profound implications for the interpretation of quantum physics theories and measurements as well as practical implications for formulating theories. The research line that combines algebra and logic, with extensions to both mathematical physics and computer science, will be continued. The search for a proof of the Jacobian conjecture continues to generate valuable spin-offs. The applied stochastics research, which has been re-oriented, will be further strengthened in the overlapping area between stochastics, physics and neuroscience, fostering further the cooperation with the Donders Centre for Neuroscience. A visiting professor of applied numerical mathematics has been appointed to augment teaching in pure and applied mathematics.

# Institute for Computing and Information Sciences

Computer systems now influence virtually every aspect of our lives. Sometimes these systems appear in an easily recognizable form, as in eCommerce sites such as Amazon and pocket calculators, but they are also increasingly hidden inside public transport cards (such as the OV chip card), television sets, multimedia devices, mobile phones, cars and washing machines, for example. This trend is known as ambient computing. However, while computing is becoming increasingly pervasive, there are growing problems with software in terms of security (breaches of information access restrictions or privacy), reliability (the system behaves erratically), safety (use of the system is harmful), trustworthiness (low reliability of system services), efficiency (the system is unable to handle problems of a particular size) and conformity with requirements. The inherent complexity of computer-based artefacts – together with the slow pace of software development, high costs and strong competitive pressures – further complicates the search for solutions.



The mission of the Institute for Computing and Information Sciences (iCIS) is to improve the fundamentals of software development via formal, mathematically founded theories, methods and tools that support the specification, design, analysis and evaluation of computer-based systems. Research aims include improving the quality of software, with an emphasis on enhancing reliability, security, architectures and system alignment. Work at the Institute is inspired by problems encountered in society and in other disciplines. The applicability of the methods and tools is validated by tackling these problems. In 2010 the results of the nationwide research assessment by an international committee were published and iCIS has been judged to be the best Computing Science institute in the Netherlands.

Research within iCIS is organized within three themes:

## *Model Based System Development (MBSD)*

The approach used is to explore various formal methods for model construction, implementation, testing and validation, with the explicit aim of bridging the gap between theory and practice through collaboration with stakeholders from industry and other application areas.

## *Digital Security (DS)*

Researchers develop theories and formal methods, which they use to analyze and improve the security of the digital world. This involves on the one hand investigating the security and correctness of software and other systems, and on the other identity-centric security and privacy, *i.e.* developing notions and protocols for managing and protecting digital identity.

## *Intelligent Systems (IS)*

The aim here is to develop and apply intelligent systems that are able to learn knowledge and reason with it, with as a long-term research goal the alignment between computer-based intelligent systems and their users, answering questions such as how to optimally combine knowledge from human experts with measurement data, how to enable users to guide computerized proof assistants and how to let humans profit optimally from a large repository of structured knowledge.

## *Collaboration*

International cooperation is integral to the work done at iCIS, because developments in computing take place around the globe. Partners include the Dutch Ministry of Internal Affairs (BPR), ST Microelectronics, Brussels, Belgium (PINPAS), University of



## Staff

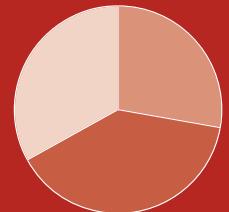
Prof. H.P. Barendregt (o)  
Prof. E. Barendsen (p)  
Prof. J.H. Geuvers (o)  
Prof. T.M. Heskes (o)  
Prof. J.J.M. Hooman (o)  
Prof. B.P.F. Jacobs (o)  
Prof. J.W. Klop (e)  
Prof. W. Kraaij (e)  
Prof. M.J. Plasmeijer (o)  
Prof. J.J.M.M. Rutten (e)  
Prof. F.W. Vaandrager (o)  
Prof. E.R. Verheul (e)  
Prof. M. van Vliet (e)  
Prof. Th.P. van der Weide (o)  
Prof. H. Zantema (e)

### Tenured

Full Professors	4.9 FTE
Associate Professors	2.1 FTE
Assistant Professors	5.0 FTE

### Non-tenured

Researchers	20.1 FTE
Doctoral candidates	29.8 FTE



■ FTE 1<sup>st</sup>  
■ FTE 2<sup>nd</sup>  
■ FTE 3<sup>rd</sup>

*< Smart cameras used to identify vehicles are linked to data systems and thus able to 'read' more than just number plates. The Digital Security group, which investigates computer security and privacy aspects, plays an active role in the public debate about these issues.*

Grenoble Joseph Fourier, France (Tarot), RWTHA, Aachen, Germany (Quasimodo, Mobius), Cap Gemini, Netherlands (extra-ordinary professor), Makerere University Kampala, Uganda (NUFFIC), INRIA Microsoft Research Lab Paris, France (Mobius, EU FET), TNO Telecom, Delft, the Netherlands (PEARL), Aalburg University, Denmark (Quasimodo, Artist2) and Océ Technologies, Venlo, the Netherlands (Octopus).

## Research results

In 2010 the groundbreaking work on the cryptanalysis of RFID tags continued. Together with TNO, research focused on the privacy-friendly use of RFIDs. In addition, a lab has been built for research on side-channel to explore whether, for example, detailed insight into a card's electricity consumption can reveal secret information. Prof. Bart Jacobs received a TOP grant together with Prof. Klaas Landsman of IMAPP, for research in quantum computing.

In collaboration with the group led by Ole Jensen at the Donders Centre for Cognitive Neuroimaging, the Intelligent Systems group has developed a new paradigm for brain-computer interfaces based on covert attention, which is an important step towards a natural 2D brain-computer interface.

Intelligent Systems organised this year's Pattern Recognition in Bioinformatics conference (22-24 September). The MathWiki project has resulted in a number of applications relating to the presentation of formal mathematics via the web. One of them is a first MathWiki for the Mizar proof assistant, which was presented at the MKM conference in Paris. This makes it possible to present Mizar proof development on the web, with its whole linking structure, so that the definition of objects can be inspected via a mouse click. It also provides the standard wiki functionalities of commenting and documenting developments. Another application (also presented at MKM) is the Proviola machinery, which makes it possible to render a Coq tactic file together with its interactive development in a web browser. A further publication on this work, focused on the 'narration' of formal proofs, was presented at UITP in Edinburgh.

In the field of proof assistants, work done by Urban and others has combined Mizar with Automated Theorem Proving tools. This has led to publications in MKM, ICMS and LPAR and also to the granting of a joint project in the Open Competition of the Netherlands Organization for Scientific Research (NWO) together with the Machine Learning group. The idea is to combine proof assistants with techniques from machine learning called 'Learning to Reason':

# Institute for Computing and Information Sciences

## Key publications

Aarts, F. & Vaandrager, F. (2010). Learning I/O Automata. In P. Gastin & F. Laroussinie (Eds.), *CONCUR 2010 - Concurrency Theory* (Lecture Notes in Computer Science, 6269) (pp. 71-85). Berlin: Springer.

Alvim, M.S., Andres, M.E. & Palamidessi, C. (2010). Probabilistic Information Flow. In *Proceedings of the 25th Annual IEEE symposium on Logic in computer science, LICS 2010, 11-14 July, Edinburgh* (pp. 314-321). New York: IEEE.

Garcia, F. D., Rossum, P.J.B. van, Verdult, R. & Wicher Schreur, R. (2010). Dismantling SecureMemory, CryptoMemory and CryptoRF. In *CCS'10 : 17th ACM conference on Computer and communications security, Chicago, IL, USA, october 4-8, 2010* (CCS'10 : 17th ACM conference on Computer and communications security, Chicago, IL, USA, october 4-8, 2010) (pp. 250-259). [S.l]: ACM.

Gerven, M.A.J. van, Cseke, B., Lange, F.P. de & Heskes, T. (2010). Efficient Bayesian multivariate fMRI analysis using a sparsifying spatio-temporal prior. *Neuroimage*, 50(1), 150-161.

Groningen, J. van, Noort, T. van, Achter, P., Koopman, P. & Plasmeijer, R. (2010). Exchanging sources between clean and Haskell: a double-edged front end for the clean compiler. In J. Gibbons (Ed.), *Haskell '10 : proceedings of the third ACM Haskell symposium on Haskell* (pp. 49-60). New York: ACM.

Heunen, C. & Jacobs, B. (2010). Quantum Logic in Dagger Kernel Categories. *Order*, 27(2), 177-212.

Hommersom, A. & Lucas, P.J.F. (2010). Using bayesian networks in an industrial setting: Making printing systems adaptive. In H. Coelho & R. Studer (Eds.), *ECAI 2010 - 19th European Conference on Artificial Intelligence Vol. 215. Frontiers in Artificial Intelligence and Applications* (pp. 401-406). Amsterdam: IOS Press.

Kaufmann, M., Paulson, L., Geuvers, H., Koprowski, A., Synek, D. & Weegen, E.E. van der (2010). Automated Machine-Checked Hybrid System Safety Proofs. In *Interactive Theorem Proving* (Lecture Notes in Computer Science, 6172) (pp. 259-274). Berlin / Heidelberg: Springer.

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Dissertations:	5
Scientific publications:	196
Professional publications:	12

a Machine Learning Approach for Computer-Assisted Reasoning. In terms of formalizations, the Coq formalized safety proofs of hybrid systems have been completed. Also, the ForMath project – an EU STREP-FET project coordinated by the University of Gothenburg – has started. In Nijmegen work has been done on reformulating our existing Coq CoRN repository using type classes, to enhance its usability. On the theory side, a variation on the presentation of typing rules has been developed, by moving the typing information for free variables from the context to the variable itself (as a label).

In the Model Based System Development section a new method was developed – based on the mathematical principle of convolution – that allows the merging of discrete and continuous probability distributions of Bayesian networks. This method will make it easier to develop probabilistic models for actual applications. Two probabilistic reasoning systems have been developed on top of Google's android operating system which allows the use of an

android-based Smartphone to support the disease management of patients in the home environment. Novel in this work is the fact that the Smartphone apps support the interpretation of physiological measurements. The main focus is on the home treatment of patients with COPD and pregnancy-related disorders. In close collaboration with colleagues at the Universities of Uppsala and Dortmund, the Institute started a new research line on automata learning. The aim is to infer state machine models automatically through observations and tests, *i.e.* through black-box reverse engineering of components. Based on some general information about how an application handles data, we succeeded in automatically creating learning models of some realistic communication protocols (TCP, SIP and the new biometric passport). We also generalized learning algorithms for Mealy machines to the more general setting of I/O automata.

A new method was developed to ensure deadlock-free routing, functional correctness and the 'liveness' of Network-on-Chip

## Director: Prof. Tom Heskes

Tom Heskes has been a Full Professor since 2008, specializing in Artificial Intelligence, in particular Bayesian machine learning. Since 2007 he has been a Principal Investigator at the Institute for Computing and Information Sciences and an Affiliated Principal Investigator at the Donders Centre for Neuroscience. He won a prestigious Vici grant from the Netherlands Organization for Scientific Research in 2006 and is Editor-in-Chief of the journal *Neurocomputing*.



## Institute for Computing and Information Sciences

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designs. In November 2010, members of the section Model Based System Development organized PoEM 2010 on the practice of enterprise modelling.

### Societal impact

The Institute's impact is evident in various industrial projects designed to improve the quality of software, for instance in the medical domain (decision support systems in the context of breast cancer screening – system development for electronic monitoring of pregnant women with a high risk of toxæmia- testing 'mindfulness') and with Océ© and ASML (model checking). In the HearClip project, a new fitting paradigm has been developed for personalizing hearing aids to the characteristics and preferences of individual subjects.

Computer security and privacy are increasingly important issues in our modern information society. The Digital Security group not only addresses these concerns through its research, but also plays an active role in the public debate about these issues. The group's expertise in these matters also continues to be actively sought, especially by various branches of the Dutch government. For instance, Prof. Jacobs was invited speaker at a Senate (Eerste Kamer) hearing on electronic patient files in The Hague on March 22, 2010. The group has also investigated the correctness of the software responsible for automatically closing the Maeslant storm surge barrier, which protects Rotterdam and its surrounding area. Members of the Digital Security group are also actively involved in issues such as privacy-friendly public transport cards, electronic road pricing, and smart electricity meters and identity cards.

Bayesian techniques developed at iCIS are being used to combine data with background knowledge, for instance to localize sources in the brain and to improve the performance of brain-computer interfacing. The institute continued to run CodeYard, an innovative project set up to interest and involve high school students in the Netherlands and Belgium in computer science. Our 'Web Deduction' system ([www.prover.cs.ru.nl](http://www.prover.cs.ru.nl)) is used to teach logic in a number of courses at several universities.

### Future research

Within the section Intelligent Systems Joris Mooij received an NWO Veni grant to develop mathematical methods for determining the causal structure of biological processes. The project 'Identification of synaptic gene networks in complex brain disorders using a Bayesian framework' (SYNCOBE), which was funded by the NWO research programme on Complexity in September 2010, will continue. Research on the logical structures of quantum systems – funded by a Top grant which Bart Jacobs (Digital Security) received together with Klaas Landsman (IMAPP) – will start next year. Research will also continue on other projects, including the European FP7 project Quasimodo, the European research project CHARTER, STITPRO (on monitoring pregnant women), the Vici project coordinated by Prof. Heskes and research on identity-centric security. On 1 January 2011, Dr Mireille Hildebrandt was appointed Professor of Smart Environments, Data Protection and the Rule of Law within the Digital Security section of the Institute to do research on the social, ethical and legal implications of the new ICT infrastructure. Moreover, the monograph 'Lambda Calculus with Types', which was accepted by Cambridge University Press, will appear in spring 2011.

# Institute for Science, Innovation & Society

In today's knowledge society, scientific, technological and societal developments are closely interrelated. We find ourselves in the midst of a technoscientific revolution that affects all aspects of society, resulting in a dramatic increase in the scale and pace of knowledge production and in the emergence of new converging technologies in ICT, genomics and nanotechnology. These developments affect the way we see ourselves and challenge the relationship between science, technology and society. Science and technology clearly have a profound influence on society, but the reverse is also true: society significantly shapes the ways in which science and technology evolve. Science and society are mutually pervasive.



The Institute consists of three departments: Philosophy and Science Studies, Sustainable Management of Resources (DSMR) and Innovation Studies. Researchers in these departments address the following themes: 1) *New visions of nature*, 2) *Societal aspects of emerging life sciences*, 3) *Sustainability* and 4) *Managing innovation*.

## *Department of Philosophy & Science Studies*

*New visions of nature.* The focus of research here is on philosophical issues involved in developing 'new nature' and on communication about science. In collaboration with IWWR, we initiated a project funded by the Ministry of Economic Affairs, Agriculture and Innovation on communication and policy related to invasive exotic species. *Societal aspects of emerging life sciences.* In 2004, the Centre for Society and Genomics (CSG) was established. CSG is an interactive research centre that combines scholarly activities with innovative societal interaction and collaboration with genomics researchers, policy makers and societal stakeholders. Its basic objective is to analyse, assess and improve the societal embedding of genomics, aligning scientific with policy and raising the quality of societal debate. The research has three main lines: 1) governance of genomics applications, 2) transforming agendas for knowledge production and 3) communication and education. Collaboration with all

of the 15 Genomics Centres funded by Netherlands Genomics Initiative (NGI) is central to the programme.

## *Department for Sustainable Management of Resources (DSMR)*

New visions of nature and Sustainability. An important focus is sustainable water management. Research addresses a variety of issues, combining scientific and societal perspectives and building on the ways in which researchers, policy makers, politicians and citizens view these issues. For centuries, the emphasis has been on technological mastery of river systems. Now, a more ecocentric approach is emerging. This ecological approach calls for sustainable planning of river basins, involving economic, ecological, societal and spatial planning. Research is carried out on a regional, national and international scale.

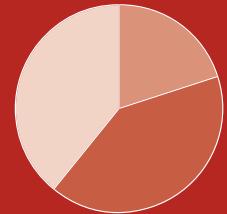
## *Department of Innovation Studies*

The MICORD research programme focuses on problems of innovation and collaboration in three sectors of economic importance: food, chemicals and equipment manufacturing. Research is conducted in close cooperation with the Centre for Innovation Studies (CIS) of Nijmegen School of Management.



## Staff

Prof. B. Dankbaar (o)  
Prof. W.T. de Groot (o)  
Prof. F.W.J. Keulartz (e)  
Prof. C.H. Lüthy (p)  
Prof. A.J.M. Smits (o)  
Prof. J. de Wit (e)  
Prof. H.A.E. Zwart (o)



■ FTE 1<sup>st</sup>  
■ FTE 2<sup>nd</sup>  
■ FTE 3<sup>rd</sup>

### Tenured

Full Professors	1.5 FTE
Assistant Professors	1.3 FTE
Researchers	0.6 FTE

### Non-tenured

Researchers	4.6 FTE
Doctoral candidates	7.9 FTE

Collaboration between universities and industry on research-based product innovation and early involvement of stakeholders has been shown to result in more robust innovation.

## Collaboration

Within Radboud University Nijmegen: *Institute for Molecules and Materials* (IMM), *Institute for Water and Wetland Research* (IWWR), *Nijmegen Centre for Molecular Life Sciences* (NCMLS) and *Centre for Innovation Studies* (CIS). Regionally, Waalweelde and Freude am Fluss are projects in which various regional societal partners participate. Nationally, CSG is a national research centre, the core of which is located at the Institute. The current programme (CSG Next) involves collaboration with six departments at other universities and with sixteen research centres within the genomics network funded by NGL, but also with societal organizations and companies such as Unilever.

## International collaboration

### Department of Philosophy / CSG

CSG collaborates with a number of international partners, notably the ESRC Genomics Network (Lancaster, Cardiff, Exeter and Edinburgh) in the UK. Leading researchers at CSG co-edit the online journal *Genomics, Society & Policy* and are currently consolidating an international network of groups working in the field of ELSA life sciences research to secure international funding opportunities for the future.

## DSMR

With the University of Duisburg-Essen (a partner in the IRUN Network) and in collaboration with IWWR, ISIS offers a two-year international Masters programme on Transnational Ecosystem-based Water Management ([www.twm-master.com](http://www.twm-master.com)). Together with Chinese, Netherlands and German governmental and non-governmental organisations (GOs and NGOs) as well as universities, a knowledge exchange platform was launched to explore sustainable river basin management (the Healthy Yangtze project). This project creates a space in which scientists, consultants, civil servants and entrepreneurs involved in water management innovations can exchange knowledge and experience and identify cooperative ventures in research, education and business. Participants in China are Tsinghua University, the Chinese Academy of Sciences and the National Science Foundation.

DSMR is either the lead applicant or otherwise involved in four research/educational projects funded by one of the three European Interreg programmes (Interreg A, B and C), in which various GOs, NGOs and universities are involved:

- SIRE (Interreg IIIA); Germany
- Transnational Water Management (Interreg IIIA); Germany

# Institute for Science, Innovation & Society

## Key publications

Boekhorst, D.G.J. te, Smits, A.J.M., Yu, X., Lifeng, L., Lei, G. & Zhang, C. (2010). Implementing Integrated River Basin Management in China. *Ecology and Society*, 15(2), 1-23.

Consoli, L. (2010). String Theory and the Anthropic Principle. *Studies in Science and Theology*, 12, 243-256.

Dankbaar, B. & Vissers, G.A.N. (2010). The changing role of the Firm. In R.E. Smits & S. Kuhlmann (Eds.), *The Theory and Practice of Innovation Policy* (pp. 53-76). Cheltenham: Edward Elgar.

Drenthen, M. (2010). NIMBY and the Ethics of the Particular. *Ethics, Policy & Environment*, 13(3), 321-323.

Hunka, A.D. & Groot, W.T. de (2010). Participative environmental management and social capital in Poland. *Social Geography Discussions*, 6(1), 39-50.

Lüthy, C.H. (2010). Centre, Circle, Circumference: Giordano Bruno's Astronomical Woodcuts. *Journal of the History of Astronomy*, 41, 311-327.

Scholte, P. & Groot, W.T. de (2010). From debate to insight: Three models of immigration to protected areas. *Conservation Biology*, 24(2), 630-632.

Zwart, H. (2010). The Nobel Prize as a Reward Mechanism in the Genomics Era: Anonymous Researchers, Visible Managers and the Ethics of Excellence. *Journal of Bioethical Inquiry*, 7(3), 299-312.

Zwart, H.A.E. (2010). *De waarheid op de wand: psychoanalyse van het weten*. Nijmegen: Vantilt.

Dissertations:	6
Scientific publications:	51
Professional publications:	4

- Freude am Fluss (Interreg IIIB); Germany, France
- River Cross (Interreg IIIC); Germany, Greece, Poland.

## Innovation studies

MICORD receives research funding from a number of international companies, including AkzoNobel, Philips, Shell and the Dutch Polymer Institute.

## Research results

ISIS has initiated a series of ambitious, large-scale research projects involving a broad range of key players in universities and in society. These programmes are now delivering results. The number of PhD theses has increased exponentially. During the period 2003-2008, 5 theses were completed and defended over five years. In 2010, 6 theses were defended in one year and this level of output will continue in the years ahead.

Three new collaborative research projects were launched: on the societal aspects of biomaterials (in collaboration with IMM), on the societal dimensions of research and communication on exotic species (in collaboration with IWWR) and on the management of societal expectation of emerging life sciences technologies (in collaboration with NBIC).

At the international level, CSG organized its bi-annual academic conference on the societal dimensions of genomics in Amsterdam: *Ten Years After: Mapping the Societal Landscape of Genomics*, in collaboration with the ESRC Genomics Network (UK) and VALGEN (Canada). During this conference, the results of a number of research projects conducted at ISIS were presented to international peer audiences.

*Visions of nature* - research involves analysing assessing and promoting the transition in nature management towards a more ecocentric approach, e.g. it has been shown how various 'readings' of the significance and meaning of landscapes can be used as sources of inspiration for 'new nature' development, how conflicting claims and expectations can be addressed and how various stakeholders can be more actively engaged in nature development projects. Outreach is reflected in a large number of both academic and public partners who collaborate in projects, including GOs and NGOs in China, Western Europe, Eastern Europe and the EU Region Rhine-Waal.

*Societal aspects of emerging life sciences* - There is a tendency for current techno-scientific developments to raise great expectations in terms of societal relevance. Claims range from 1) contributing to a more sustainable interaction with nature - through biomimetic, nature-friendly technologies, to 2) improving the health and quality of human life through human genomics, and 3) developing alternatives to current experiments involving the use of animals. Researchers at the Institute analyse these claims in order to make them more feasible and robust.

## Director: Prof. Hub Zwart

Hub Zwart has been a Full Professor Philosophy of Science at Radboud University Nijmegen since 2000. The focus of his research is on epistemological and ethical issues in the life sciences: biomedicine (1988-1996), research with animals (1996-2003), environmental research (1998-2003), genomics (2003-now). He was also European leader of the EU-Canada exchange program Coastal Values (1999-2003). Since 2004 Prof. Zwart has been the director of the Centre for Society & Genomics.



## Institute for Science, Innovation and Society

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**Managing innovation:** collaboration between universities and industry on research-based product innovation and early involvement of stakeholders have been shown to result in more robust innovation.

### Societal impact

At the Institute societal interaction and stakeholder involvement are closely connected, *e.g.* with DSMR research on river management. Local stakeholders at Heerewaarden and Zaltbommel (Waal river region) are empowered through so-called 'Communities of Ownership' with knowledge and skills so that they can design their own land use plans along the Waal River and contribute to sustainable development. Through action research and by applying the method of 'learning histories' this process deduces generic mechanisms that play a pivotal role in the transition of local communities towards more sustainable development. Based on Institute research, the Ministry of Infrastructure & Environment initiated a pilot project on a sandbar in the Waal River, in which the morphological and ecological development of a complex of side channels will be monitored and used for successful up-scaling of a nature management plan.

The MICORD research programme organizes 'Open Innovation', emphasizing innovation pathways beyond the borders of individual enterprises, through networking relationships. PhD students have shown for instance how 'people management' can be effective in supporting outside networking by employees in R&D departments in the food industry, or how collaboration between firms and

universities can take different forms, depending on the type of innovation envisaged. It also shows that Top (technology) institutes play a unique role and therefore require continuing investment by government, an issue that is at the heart of the current debate on innovation.

Interactive research is also at the core of the CSG Next research programme, focusing for example on how the credibility of claims about food quality and health are tested and assessed by firms like Unilever, especially in R&D units. Insights from this research allow Unilever to optimise this process. In collaboration with the Toxicogenomics Consortium, claims about the prospects for developing non-animal alternatives for toxicity testing are assessed. Another important topic is the role of scientific experts in public and policy debate. The Institute collaborates with the Nijmegen debating centre LUX to test a range of views.

### Future research

On the one hand, genomics has changed the way in which research is becoming increasingly being embedded in the life sciences. As a result, the focus of research will shift to analyzing and assessing the societal dimensions of other emerging life sciences such as synthetic biology and systems biology. While in the recent past there has been a great deal of emphasis on academic and policy controversies in creating new nature, both exotic and previously indigenous wild species are now penetrating landscapes. This represents an important challenge for research at the Institute, policy and public engagement, nationally as well as internationally.

# Glossary

(e)	Extraordinary chair	NHS	Nederlandse Hartstichting – Netherlands Heart Foundation
(o)	Ordinary chair	NISCO	Nijmegen Institute for Social & Cultural Research
(p)	Personal chair	NROG	Nationaal Regie-Orgaan Genomics – Netherlands Genomics Initiative
AGIKO	Arts/assistant-geneeskundige in opleiding tot klinisch onderzoeker – someone who has a Master's degree in Medicine, has met the internship requirements, and is training as a clinical researcher	NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek – Netherlands Organisation for Scientific Research
BSI	Behavioural Science Institute	N4i	Nijmegen Institute for Infection, Inflammation and Immunity
CLS	Centre for Language Studies	OO&R	Onderzoekscentrum voor Onderneming & Recht – Business and Law Research Centre
CMBI	Centre for Molecular and Biomolecular Informatics	RST	Research Institute for Religious Studies and Theology
CMR	Centrum voor Migratierecht – Centre for Migration Law	Senter	An agency of the Netherlands Ministry of Economic Affairs which is responsible for managing grant allocation in technology, energy, environment, export and international cooperation
CNR	Centrum voor Notarieel Recht – Centre for Notarial Law	Spinoza	The most prestigious prize for scientists in the Netherlands who are at the very top of their research profession, awarded by NWO
DCC	Donders Centre for Cognition	SteR	Onderzoekscentrum voor Staat en Recht – Centre for State and Law
DCCN	Donders Centre for Cognitive Neuroimaging	STW	Technologiestichting STW – Technology Foundation STW (Netherlands)
DCN	Donders Centre for Neuroscience	UMC	Radboud University Nijmegen Medical Centre
DFG	Deutsche Forschungsgemeinschaft – German Research Foundation	Veni grant	Personal grant from NWO awarded over a period of three years to researchers who have recently obtained their PhD, to allow them to continue to develop their ideas
DFN	Diabetes Fonds Nederland – Dutch Diabetes Research Foundation	Vidi grant	Personal grant from NWO awarded over a period of five years to researchers who wish to develop an innovative line of research in which they appoint one or more co-researchers
ERC	European Research Council	Vici grant	Personal grant from NWO awarded over a period of five years to senior researchers who wish to establish their own research group
ESF	European Science Foundation	ZonMw	ZorgOnderzoek Nederland NWO Medische Wetenschappen – Netherlands Organisation for Health Research and Development
FOM	Stichting voor Fundamenteel Onderzoek der Materie – Foundation for Fundamental Research on Matter (Netherlands)		
FP6 ; FP7	EU Framework Programme 6, respectively 7		
FTE	Full-time equivalent for research		
FTE 1 <sup>st</sup>	Full-time equivalent for research directly funded by government		
FTE 2 <sup>nd</sup>	Full-time equivalent for research funded by KNAW or NWO		
FTE 3 <sup>rd</sup>	Full-time equivalent for research funded by other public and/or private organizations		
HLCS	Institute for Historical, Literary and Cultural Studies		
ICIS	Institute for Computing and Information Sciences		
IGMD	Institute for Genetic and Metabolic Diseases		
IMAPP	Institute for Mathematics, Astrophysics and Particle Physics		
IMM	Institute for Molecules and Materials		
IMR	Institute for Management Research		
IRUN	International Research Universities Network		
ISIS	Institute for Science, Innovation & Society		
IST	Information Society Technologies		
ITEA	Information Technology for European Advancement		
IWWR	Institute for Water and Wetland Research		
KNAW	Koninklijke Nederlandse Academie van Wetenschappen – Royal Netherlands Academy of Arts and Sciences		
KWF	Koningin Wilhelmina Fonds – Dutch Cancer Foundation		
MPI	Max Planck Institute for Psycholinguistics, Nijmegen		
NCEBP	Nijmegen Centre for Evidence-Based Practice		
NCMLS	Nijmegen Centre for Molecular Life Sciences		

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